The building and works of the office of ordnance at the Tower of London, 1660-1722.

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The Buildings and Works of the Office of Ordnance at the Tower of London, 1660-1722

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ABSTRACT

Following the Restoration, the Office of Ordnance enjoyed a period of considerable expansion at the Tower and between 1663 and 1676 replaced the old royal palace with a complex of stores and offices. Additional facilities were erected about the White Tower and between 1688 and 1692 the largest storehouse ever seen at the fortress, the Grand Storehouse, was built. By now, however, depots such as Plymouth and Portsmouth were being rapidly developed and the centuries-old dominance of the Tower as the central arsenal of the nation was coming to a close. Throughout the reign of Charles II the Office endeavoured to modernise the Tower's defences and improve the condition of the garrison. Despite considerable effort, the former was never effectively addressed and at the start of the Hanoverian period many of the gun batteries that had been introduced were removed. These reductions coincided with a fresh bustle of building work as the fortress assumed a more specialised role in the Ordnance supply and storage operations. Firearms were now the dominant military commodity in store and consequently the facilities of the Small Gun Office were expanded. Two new Ordnance establishments appeared in 1716. The first, the Drawing Room, made a significant contribution to the development of surveying in Britain during the eighteenth century: the second, the Modelling Room, played a key role in the introduction of new patterns for the manufacture of guns and gun carriages. In 1670 the Ordnance assumed control of the Armoury Office and with it responsibility for a large collection of historic arms and armour, some of which was already being shown to the public in a museum-like manner. These displays were extended and new ones devised, thereby encouraging the process whereby the Tower became the major tourist attraction that it is today.

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ABBREVIATIONS

B.L.	British Library
B.M.	British Museum
Cal. SP Dom.	*Calendar of State Papers Domestic*
Cal. Treas. Books	*Calender of Treasury Books*
Dart. MS.	Dartmouth Collection, Staffordshire County Record Office
E	Exchequer, Public Record Office
PC	Privy Council, Public Record Office
PRO 30	Pritchett MS. Public Record Office
P.R.O.	Public Record Office
PROB	Probate Records, Public Record Office
R.A.	Royal Armouries, Tower of London
SP	State Papers, Public Record Office
T	Treasury, Public Record Office
WO	War Office, Public Record Office
WORKS	Office of Works, Public Record Office

Note on dates, spelling, etc.

All dates are given in the English Old Style (that is the Julian Calendar). The new year, however, has been taken to start on 1 January rather than 25 March.

Spelling and punctuation have, where necessary, been modernised to improve clarity.

Most of the page and folio references quoted from P.R.O. manuscripts are original - new numbering systems having been introduced after research was under way.

INTRODUCTION

(i) History of the Ordnance Office The origins of the Ordnance Office may be traced back to the reign of Edward I when the Privy Wardrobe began to act as an itinerant armoury for the royal forces campaigning in Wales. Though it existed as a permanent storehouse with a permanent staff the Privy Wardrobe continued its peripatetic existence throughout the reigns of Edward I and Edward II, during which time it was subordinate to the King's Chamber and the Great Wardrobe.[1]

An important chapter in the evolution of the Privy Wardrobe took place on 17 July 1323, when John Fleet was appointed 'keeper of the part of the king's wardrobe in the Tower of London'. Though the wording of Fleet's subsequent appointments vary - for example on 17 May 1338 his patent styled him `keeper of the king's jewels, armour and other things' - it is clear that under his authorship a settled organisation specialising in the provision of arms and armour was established at the Tower. Under the subsequent keepership of Robert Mildenhall, the Tower establishment became increasingly independent of the parent organisations with separate accounts of its activities being submitted to the Exchequer, even though Mildenhall was still a clerk and receiver of the Chamber and the Mint. With the retirement of William Rothwell as Keeper in 1360 the emancipation of the Privy Wardrobe at the Tower was completed when the offices of the Keeper of the Mint and the Wardrobe were separated.

The process by which the Privy Wardrobe at the Tower was replaced by the Office of Ordnance is not clear. Master Nicholas Merbury is the earliest known Master of the Ordnance being appointed by letters patent in 1414.[2] It would appear that the role of the Master of the Ordnance, together with that of the 'Keeper of the King's armour in the Tower of London' who is first mentioned in 1423, replaced that of the Keeper of the Privy Wardrobe. For although the latter continued to be appointed until 1476, the post effectively became a sinecure with no accounts being rendered after 1407. In summary,

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1. The origins and development of the department may be traced in Tout (1928); Hogg (1963), Vol. I, pp. 3-82; Tomlinson (1979); Forbes (1929), provides a useful summary.
2. Printed by Hogg, *ibid.*, p. 27, note 92.

therefore, all that can be said with certainty is that the Ordnance and Armoury developed as offshoots of the Privy Wardrobe and became separate organisations which took over its responsibilities in the same way that the Great Wardrobe and the King's Chamber emerged from the structure of the Wardrobe during the thirteenth century.

In the patent appointing the Master of the Ordnance in 1430 reference is made to a yeoman, though the first appointment of this office, and that of a clerk, which is mentioned as early as 1414, did not appear by way of patent until 1484. Neither the Yeoman nor the Clerk had fixed responsibilities, rather they performed any duties which contributed to the smooth running of the department. Alongside the three officials worked a group of skilled craftsmen, gunners and engineers who were appointed by direct warrant from the Crown. Based at the Tower, where the master enjoyed an official residence, the Ordnance of the late Middle Ages had completed the first stage of its evolution and had laid the foundations of an organisation which was set to become a major department of state during the reign of Henry VIII .

The sweeping changes that were introduced under the mastership of Sir Christopher Morris (1536-43) saw the creation of a number of new posts, namely the Lieutenant, Clerk of the Deliveries, Surveyor and Storekeeper. Conversely the office of Yeoman declined in importance and by 1584 had disappeared. During the 1540s, financial reforms were also set in motion which saw payments beginning to be made through Ordnance treasurers from monies voted to the Office in advance of requirement.

During the Elizabethan period the duties of the Ordnance officers were laid down in a series of instructions. The earliest regulations required the principal officers to meet at least once a month 'to consider the state of the stores, and to draw up supply lists', but not until 1597 were they formally constituted as a Board.[1]

In the early years of the seventeenth century the importance of the Office as a department of state was emphasised when the titles of Master and Lieutenant were re-styled

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1. *Records of the Board of Ordnance*, P.R.O., Information Guide No. 67 (1987).

Master-General and Lieutenant-General. Otherwise there seem to have been no significant changes in the internal structure of the organisation. Indeed, even the rupture caused by the outbreak of the civil war appears to have had no profound effect on the long term development of the department.

From September 1642, following the seizure of the Ordnance supplies at the Tower and the dispossessing of the principal officers, there were two offices - one Royalist and one parliamentarian. The former, based at Oxford, proved to be ephemeral, lasting only the duration of the first civil war. The composition of the parliamentary establishment at this time seems to have altered little as evidenced by a list drawn up in 1643, which apart from the members of the Board, consisted of treasurer, keeper of small guns, keeper of rich weapons, master gunner, seven clerks, eleven artificers and twenty labourers.[1]

Four years after the Restoration, and with the Treasurer elevated to a position on the Board, the establishment had experienced modest expansion with the under officers now listed in an official document as master gunner, keeper of small guns, master smith, master plumber, master carpenter, master wheelwright, master cooper, two proof masters, two furbishers, messenger, twenty labourers and ninety-eight 'fed' (i.e. salaried) gunners. In addition there were a number of others 'not upon the constant Ordnance pay of the Office' which included a founder, gunsmith, pikemaster, turner, laddlemaster, chandler, ironmonger and cutler.[2] The same document defines the role of the department, stating that:

> 'the Office of Ordnance is (according to its instructions) the standing & Grand Magazine of all the necessary habiliments and Instruments of warre (as well by Sea as Land) for the defence & safety of the Kingdome & consequently hath influence of the Navies, Forts, Castles, Marching Trains of Artillery, & Armies of this Kingdome whether they relate to sovreigne or domestick services'.

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1. WO 54/16.
2. SP 29/67, ff. 176-81.

During the next few years these responsibilities were to be further expanded. In 1667 the building and maintenance of fortifications became more strictly regulated by the Ordnance[1] while in 1670 the manufacture, storage and distribution of armour came under the remit of the Office after it assumed the functions of the Armoury.[2] A similar amalgamation took place in October 1685 when the Ordnance took over the duties of the Office of Tents and Toils, which had previously been accountable to the Lord Chamberlain, thereby becoming responsible for the storage and distribution of tents, waggons and related utensils,[3] though in practice the Ordnance had long been accustomed to purchasing such stores for its own staff and for the garrisons.[4]

Between 1664 and 1670 the Ordnance was presided over by a group of commissioners, rather than a single master-general, and it was during this period that important attempts were made to modify and improve the pre-civil war procedures of the Office. Following the tenure of the second Ordnance commissioners (1679-82) the duties of individual officers were set down in precise detail in the Instructions issued in July 1683 at a time when George Legge, 1st Baron Dartmouth, occupied the post of Master-General. This is the most important and enduring document to be issued by the late Stuart Ordnance Office. Amended in 1686, these Instructions were to be confirmed by every sovereign from William III to George II and as late as the first decade of the nineteenth century could still be regarded as the rules that governed the conduct of Ordnance officials.[5]

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1. The key reforms relate to a royal warrant issued on 27 March 1667 empowering the Master-General Commissioners to direct the building of the Portsmouth and Plymouth defences (WO 55/332, pp. 134-5), and another dated 26 April 1667 which made them accountable for any repairs that had been made to fortifications since the Restoration (*ibid.*, pp. 157-8 & PC 6/18, p. 109).

2. PC 6/18, pp. 134-5. The merger was carried out after the death of the Master of the Armouries, William Legge. It should be noted that the stores of the Armoury and Ordnance had long been intermixed within the rooms of the large storehouse to the north of the White Tower (see p. 14 below), the maintenance of which the Ordnance seems to have been largely responsible for.

3. *Cal. SP Dom. 1685*, p. 340. This included a fleet of sumptuous wagons to facilitate the royal progress.

4. *Cf.* WO 51/6, ff. 55-6, for an exceptionally large purchase of tents, beds and bedding in December 1665, to the value of over £1100, for three companies billeted at the Tower, and WO 51/15, f. 222, a bill for officers' tents dated July 1673.

5. Tomlinson (1979), pp. 16-7.

By the end of the seventeenth century the establishment of the Ordnance had divided into Civil and Military branches. The former included the members of the Board itself, together with their clerks and other officials based at the Tower. The Military Branch comprised a master gunner and his subordinates (i.e. the 'fed' gunners), together with the civilian engineers, a fire master and fireworkers (who experimented with explosive devices) and a proof-master (who tested firearms). Against the background of a financial crisis brought about by the extraordinary demands of the War of the Spanish Succession, the establishment was subjected to a wave of reforms during the second mastership of the Duke of Marlborough (1714-22). Much, it would appear, was instigation by Brigadier-General Michael Richards, a close colleague of the Duke from the Flanders campaigns and a man promoted to the rank of Surveyor-General of the Ordnance within two months of Marlborough's return to the Office. Richards presented the Board with a list of proposals for reforming the Military Branch at the end of 1714,[1] the need for which was highlighted during the crisis of the Jacobite Rebellion the following year, when the train of artillery took all of six months to reach Scotland, by which time the insurrection had been crushed.[2] Subsequently, on 10 January 1716, Marlborough approved a set of further proposals laid before him by his principal officers. Apart from affecting important economies, the resulting measures may be linked to the orders to establish a Drawing Room and Modelling Room in the Tower during February (see pp. 92-7 below), the creation of the Royal Regiment of Artillery in May[3] and the decision to build the Brass Foundry at Woolwich in June.[4]

As may be appreciated by this brief outline, the administrative history of the Ordnance until the late Stuart period has been well-documented in a number of monographs. By comparison, the development of the Office's facilities at the Tower - the headquarters of the department and its central depository of stores - has not received the detailed attention of historians. The surviving patchy series of pre-Restoration Ordnance accounts have

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1. B.L., Stowe MS. ff. 23-6. 'A memorial relating to the present State of the Military branch of the Ordnance in order to the new modeling of the same'.
2. Chandler (1973), pp. 310-11.
3. WO 47/29, pp. 106-7, order of the Board dated 8 May.
4. *Ibid.*, pp. 139-40.

enabled an outline of developments from the late Tudor period until 1660 to be attempted (see below), but it is not until the reign of Charles II that sufficient documentation is available to allow a detailed examination of the Office's activities at the Tower to be undertaken. This is a period that saw the start of an increase in English military activity as commercial trade, particularly overseas, expanded markedly (see below). Towards the end of the seventeenth century the armed forces had become embroiled in long and tedious military campaigns on the continent and in the colonies. In all this the Ordnance had a vital role to play. The supply of the garrisons, the organisation of artillery trains, the building and maintenance of coastal fortifications and other depots all lay within its remit.

As the size and workload of the Office of Ordnance increased in line with military expansion, the physical appearance of the Tower of London underwent a profound change; the department extended its control over additional areas and modified them to meet its own needs. In defining the period chosen for study, a starting date of 1660 was selected for the reasons already mentioned. As for the close, 1722, that year marked the end of the Duke of Marlborough's second mastership of the Ordnance, by which time the great expansion of the Office at the Tower had largely come to an end with perhaps as much as two thirds of the fortress now under Ordnance control. By then the fortress had acquired a plan and appearance which, with the notable exception of some rebuilding works brought about by serious fires in 1774 and 1788, was to alter little until the last phase of modernisations carried out by the Ordnance in the 1840s.[1]

(ii) <u>The political and military background, 1660-1722</u> The period 1660 to 1722 covers the five concluding reigns of the Stuart era and much of the first Hanoverian ruler. During this time, and despite constitutional and religious upheavals, the country became increasingly accustomed to a rudimentary form of party government. The unity of England, in the face of many dangers, was consolidated and broadened by the union with Scotland in 1707.

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1. Parnell (1993), pp. 88-94.

Looked at from another point of view, and one that has obvious significance for a military establishment like the Office of Ordnance, the period was punctuated by four wars. There were two against the Dutch in the reign of Charles II (1665-7 and 1672-4) followed by two against the French, the Nine Years War under William III (1689-97) and the most prolonged and most decisive of them all, the War of the Spanish Succession (1702-13). In addition, there was a failed insurrection to restore the Jacobite line in 1715-6. In all but the last, the navy played a great part and in the French wars the army was larger and more important than it had ever been before.[1]

Under Charles II a standing army was for the first time established in England in a time of peace. The size of this force fluctuated somewhat during the French and Dutch wars, but the number of troops in the country following the return of the Tangier garrison in 1684 totalled barely six thousand.[2] Monmouth's rebellion provided James II with the means and justification for a more rapid military expansion.[3] Yet it was not James's militarism which caused the sharpest increases, but the wars fought against France between the years 1689 and 1713. By 1711 the British Army had increased to seventy thousand men, the number of regiments having almost quadrupled since the days of James II.[4] As dramatic was the increase in the size of the navy. In 1660 the number of first, second and third rate ships numbered thirty. In 1688 this had risen to fifty-nine, but by 1714 the fleet was the largest in Europe with two hundred and forty-seven ships comprising a tonnage of 167,000 and a fire-power of 10,603 cannon.[5]

The growth of the military forces placed ever-more demands on the fiscal resources of the state. Prior to 1688 total public expenditure rarely exceeded £2 million *per annum*. By the War of the Spanish Succession it had tripled to £7 million.[6] In concert with other

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1. For a general assessment of the political, military and social developments during the later Stuart and early Hanoverian periods see Clark (1980) and Williams (1982).
2. Childs (1976), p. 13.
3. Childs (1980), p. 180.
4. Fortescue (1899), p. 554. This figure does not include foreign regiments in British pay.
5. Ehrman (1953), pp. xv & xx.
6. Brewer (1989), p. 38.

western European states, Britain, during the late seventeenth and early eighteenth centuries, evolved a complex system of banking and credit to pay for its military activity and wars of endurance. The successful system she established ultimately fuelled her ascent to the ranks of a world power.

Looking at the chronology of post-Commonwealth events that led to this condition, Charles II's reign began encouragingly enough with parliament and much of the country well-disposed to the restored monarchy. The King's first minister, Clarendon, attracted early criticism for the sale of Dunkirk to the French - a move that otherwise relieved the exchequer of a considerable annual burden. In practice, however, these savings only helped to maintain another dubious asset, Tangier, an exposed outpost on the north African coast which featured extensively in the issuing of Ordnance supplies until it was abandoned in 1684.

The outbreak of the Second Dutch War in 1665 signalled the start of a busy period for England's military organisations, not least the Ordnance as it struggled to arm and supply the warships of the navy fighting for control of the North Sea and the English Channel. At first English arms were triumphant, but the Dutch soon recovered. Inadequate financial provision, to some extent the result of two natural disasters, the plague and the Great Fire, resulted in the fleet being unable to put to sea in 1667. By then criticism of the prolifigate Court and Clarendon's administration ensured that the honeymoon years that followed Charles's restoration were over. Public opinion might have turned again in the King's favour, had not the Dutch, with magnificent effrontery, sailed up the Medway and attacked the fleet that lay idly at anchor.

The shortcomings the war exposed in the country's military structure, both in terms inadequate fortifications and a poor supply network, resulted in a busy period for the Ordnance. At the Tower this saw a re-organisation and expansion of storage facilities and an attempt to improve the defences. These works were still in progress in 1672 when Charles, under the secret terms of the Treaty of Dover, led the country into another war against the Dutch in alliance with France. Public hostility against the Dutch was more than matched by hatred of the Papacy, and the catholic Sun King's victories on the

continent soon led to a clamour in parliament and in the country for a change in policy. This marked the beginning of a protestant backlash that culminated in the 'Popish Plot', and the fantastic claims of Titus Oates about a conspiracy to kill the King and place his brother, James, on the throne. Ferment and more accusations followed, and by the time Charles dissolved parliament in 1681 the country came very close to civil war.

The last years of Charles's reign were his most autocratic. Opponents were arrested or fled, parliament was dissolved, and the country was effectively governed through a Privy Council comprised of men committed to exercising the King's will. The loyalist George Legge was appointed Master-General of the Ordnance early in 1681 and shortly afterwards steps were taken to greatly enhance the garrison at the Tower of London and to further improve its defences. The significance of this can be measured by the fact that nothing on this scale had been attempted since the works carried out by Thomas Cromwell one hundred and fifty years earlier.[1] The historic role of the Tower as a base to quell any dissent in the City was being rigorously applied.

The offensive role of the Tower and Lord Dartmouth's (i.e. George Legge's) loyalty to the Crown continued into the following reign of catholic James II. Dartmouth's connection with the Tower was an important one. In 1682 he was appointed Constable of the Tower, after the post had been allowed to lapse for over one hundred years, and by royal warrant dated 11 June 1685 he raised the 7th Foot, The Royal Regiment of Fusiliers, its nucleus being two independent companies then stationed at the Tower.[2] The latter was taken in response to the threat of the Monmouth Rebellion and was just one of a number of steps taken by James II to enlarge the standing army. Ultimately these measures failed to stop 'the Glorious Revolution', and after James's flight into exile, Dartmouth was arrested and committed to the Tower he knew so well. He died there in 1689 before being brought to trial.

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1. Colvin, ed. (1975), pp. 264-8.
2. Reid (1978), p. 138.

With the country under the rule of William ans Mary, the long war with France, which opened in 1689, had a profound effect on English politics. The army was expanded beyond all recognition with over 29,000 British troops on the continent by 1697.[1] With so many forces in the field the trains of artillery sent to Ireland and the continent were truly enormous compared to anything organised before (see pp. 141-2 below). Moreover, the maintenance of the navy, which during the second half of the seventeenth century had increased in size significantly, and was now poised to replace that of the United Provinces as the leading sea power of the day, required improved facilities to service, supply and repair the ships of the line. After 1688, therefore, old yards were expanded and news ones built. Two new dry docks and basins were added to Portsmouth and an entire new yard with basin and dry dock was opened at Plymouth. Together with the dockyards at Sherness, they represented the main facilities to service the operational fleet. They were complemented by the Thames yards - Deptford, Woolwich and Chatham - which became centres of naval supply, ship-building and routine maintenance, the facilities of which were also upgraded.[2]

The expenditure of the military establishment - what Brewer has termed 'the fiscal military state' - was enormous.[3] It dwarfed anything associated with private enterprise and brought about what has been described as the 'financial revolution' of the late seventeenth and early eighteenth centuries.[4] To met the annual military expenditure new forms of taxation, notably the Land Tax, were introduced and massive loans secured. The repayments on the latter effectively brought about the National Debt as we know it today. Investors were able to place money not only in private loans and business, but also with the government. The management of these investments relied on business men, and with it grew the eighteenth-century system under which the state was financed by privileged companies; of these the most important was the Bank of England founded in 1694.

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1. Childs (1987), appendix B.
2. For a detailed assessment of the development of these sites see Coad (1989).
3. Brewer (1989), pp. 29-42.
4. Kennedy (1988), pp. 99-105.

The prolonged War of the Spanish Succession at the start of the eighteenth century placed the whole system of government finances under great strain. For the Ordnance this resulted in a severe debt crisis which, together with the shortcomings revealed during the Jacobite uprising of 1715-6, led to a series of reforms being introduced while the Duke of Marlborough was Master-General (see p. 5 above). This in turn enabled the Ordnance to undertake a programme of developments that transformed establishments at Berwick-upon-Tweed, Chatham, Woolwich, Portsmouth and Plymouth (see p. 142 below). There were also lesser developments at the Tower of London which, by the end of Marlborough's mastership, had given the fortress a more specialised role in the Office's affairs, a role that was to alter but little throughout the eighteenth and early nineteenth centuries.

In summary, during the course of sixty-two years, the Great Britain of 1722 had come a long way from the England of 1660. It had become a world power, with a huge navy and possessions around the globe. The new Hanoverian dynasty made no pretence that it ruled by divine right. It held its position by the expressed sanction of parliament, and the conflicts between Crown and state, which had bedeviled the reigns of Charles II and James II in particular, were consigned to history. If the monarchy had lost its lustre, this was more than compensated for by a new national identity and new opportunities for increased trade which set the scene for Britain's political and commercial apogee in the nineteenth century.

(iii) <u>The Development of the Tower during the Late Middle Ages and Tudor Period</u>

During the reign of Edward I, largely between the years 1275 and 1285, the defences of the castle were extended to form the concentric pattern which, with a few minor alterations and modifications, has persisted to the present day (see Fig. 1 below).[1] It would be absurd, however, to say that the architectural development of the fortress was over, for behind the walls the buildings continued to be altered and/or replaced.

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1. The essential work on the documentation of the building is Colvin, ed. (1963-76), while the most complete description of the architecture is in Brown and Curnow (1984).

Within the Innermost Ward, the buildings established during the reign of Henry III continued to attract periodic royal occupation until the reign of James I. Edward III ordered various improvements to these lodgings and it was evidently he who relocated the monarch's private apartments from the Wakefield and St Thomas's towers to a location in and around the Lanthorn Tower. No alterations of any additional note are recorded until the reign of Henry VII. Though not a frequent visitor, it was Henry who formed a second court to the east of the old palace complex with the addition of a new gallery and gardens (see Fig. 4 below). The relationship between the existing complex and the new works indicates a layout along the lines of the urban Burgundian model with its emphasis on galleries intersecting gardens within the palace plan.[1]

Henry VIII was the last monarch to carry out any substantial improvements to the old royal lodgings, considerable works being undertaken in time for the coronation of Ann Boleyn in May 1533. Thereafter, Henry, if ever, returned and Ann only for the trauma of her own execution. As Holinshed put it, the Tower had become 'rather an armourie and house of munition, and thereunto a place for the safekeeping of offenders, than a palace roiall for a king or queen to soiourne in'.[2] There remained, however, one final royal occupation and that was associated with James I's coronation. The first attempt to stage the traditional procession from the Tower to Westminster in 1603 had to be abandoned owing to plague in the City. Not wishing to disappoint his audience, however, James and the royal party entered the Tower on 12 March the following year, spending three nights there before embarking on the rescheduled procession. On 13 March the king surveyed the storehouses and various offices, struck coins in the Mint with the queen and presented them to divers persons present and watched the royal lions fight with dogs. The following day, in keeping with past precedent, he created a total of forty-three knights.[3] The Exchequer accounts reveal something of the preparations made for the visit by way of payments for works to the royal lodgings. These included the repair of ceilings, joinery, fireplaces, redecorations and the making of furniture.[4]

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1. Thurley (1993), pp. 32-4.
2. Holinshed (1588), p. 195.
3. Nicholas (1828), pp. 319-25.
4. E 351/3239.

Otherwise, however, and perhaps surprisingly after seventy-one years of royal absence, no major works were deemed necessary. The description of these reparations provides the last insight into the ancient palace, for as James rode out on to Tower Hill on 15 March to begin his triumphant procession to Westminster, the role of the castle as a royal residence had finally come to an end and with it the Tower had lost its original *raison d'etre.*

Of the various official departments that operated within the walls, the Mint, by the Tudor period, had expanded to occupy much of the three landward sides of the Outer Ward. In a bustle of activity associated with the reorganisation of the currency following the debasements of Henry VIII's last years, the pressure for space was clearly demonstrated by the construction in 1560 of a new refining house somewhere in 'Coldharbour', the heart of the old palace south of the White Tower.[1] This is not the first recorded incursion into the palace complex. In 1382 the queen's *camera* had to be cleared of chests of armour to accommodate the visit of Anne of Bohemia, while five years later piles of stone cannon balls were hastily removed from the great hall in advance of Richard II's coming to the Tower to spend Christmas.[2] Indeed, with reference to the earlier incident, the accounts state that the material was removed to 'the great tower beyond the Watergate', almost certainly a reference to the Wakefield Tower whose upper floor originally formed Henry III's great chamber, but which by the reign of Richard II seems to have been converted into accommodation for the Privy Wardrobe.[3] It is not clear whether the Ordnance inherited the chamber from the Privy Wardrobe, but by the reign of Henry VIII the Wakefield Tower had become the nucleus of the Record Office at the Tower. It is worth noting that the chamber block attached to the east face of the tower, which had also formed part of Henry III's private apartments, was granted to the king's bowmaker, an official attached to the Ordnance, in February 1474.[4]

(iv) <u>The Early Development of Ordnance Facilities at the Tower</u> The first significant area of the Tower to be granted to the Ordnance was 'all the grounde and soile called the

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1. Colvin, ed. (1975), p. 270.
2. Tout (1928), p. 479.
3. *Ibid.*, p. 476, note 6.
4. Quoted by Hogg (1963), Vol. I, p. 15.

Tower wharfe' from St Thomas's Tower to the gate at the east end of the Wharf towards St Katherine's with 'all manner of housing and other appurtenaunces sette upon the same'. This was granted to the Office after Thomas Vaughan, the Master of the Ordnance, petitioned the king for assistance in 1452, stating that: 'Foreasmuch as ther is noon housing certaynly assigned for the ordinaunce to be kept, for lack whereof ther hath growen grete hurt, and dayly doth unto the said ordenaunce and other stuffe belonging to his said office'.[1]

In a survey of 1495 reference is made to a 'house of ordnance', presumably the *domus Ordinacionum* in which stands were installed for Henry VII and his nobles to watch a tournament in May 1501.[2] The reference to the 'green' in front of the house makes it reasonably clear that the building stood where the Ordnance storehouses are known to have been later in the sixteenth century, that is to say against the rear of the curtain wall north of the White Tower (see Figs. 4 & 49 below).

In 1536 the Surveyor of the King's Works together with the Master of the Ordnance and his staff inspected the 'long house of Ordnance' upon the green north of the White Tower and found it ready to fall.[3] This perilous condition was not remedied until 1545-7 when £2894 was issued to Sir Francis Flemyng, Lieutenant of the Ordnance, to 'erect and newe buylde one howse wherein all the Kinges Ordinance and other Municions maye be kepte'. Sir Francis's accounts show that the new storehouse comprised a wooden framed structure, erected on a brick footing, with brick chimneys. The roof was covered in tile and lead gutters provided. Masons were paid for stone paving, windows, door frames and fireplaces. Joiners set up racks for hanging weapons, some installed in special rooms 'wherein all the Kinges maieties riche Weapons of his own persons should be kepte'.[4]

By 1562 the new building was itself ready to fall owing to the excessive weight that had been placed on the upper floor, a condition which promoted the purchase of a precinct in

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1. Quoted by Britton & Brayley (1830), pp. 265-6; Barter (1978), p. 107.
2. Barter, *ibid*; Colvin, ed. (1975), p. 264, note 2.
3. SP 1/100, ff. 34-6.
4. B.L., Add. Charter 16334.

the Minories to provide additional storage space and workshops.[1] At the same time the Ordnance made an advance into the old palace complex, fitting up stores in 'the Queens chambers within her lodging', and by 1599 had established an official storehouse somewhere in the ward.[2]

As far as the accounts are concerned the conversion of the White Tower into a military store seems to have begun in 1565-6 with the setting up of two armouries.[3] Their locations cannot be identified, but evidently the accommodation proved inadequate, for a commission set up on 1 July 1580 obtained an estimate for 'makinge of romes with in the greate whyte Tower ... for the placeing and hanginge upp of all the armourie'.[4] No decision to establish the new armouries is reflected in the accounts.

The activities of the late Elizabethan Ordnance Office at the Tower can be traced in some detail from the department's Debenture Books which form an unbroken series beginning in 1592. In addition, there is a preliminary inventory of stores for the year 1599 which lists all the arms and munitions storehouse by storehouse rather than item by item, thus providing a rare opportunity to name all the late Tudor storehouses in the Tower.[5] Apart from the 'storehouse in Cole=harbour' there was a Pike House, Bill House, Iron House, Rich Weapon Office, Small Gun Office and an Arrow Loft, all of which probably formed part of the old-established 'Longe Ordnance house' erected in 1545-7 north of the White Tower. In the survey of 1597 this complex can be seen as a range with most of the roof structures aligned north-south (see Fig. 4 below). There was also a storehouse in the carpenter's yard (wherever that was), two storehouses in the Mint and a powder house in the White Tower, for which in 1595 three new wainscotted doors were fitted to openings in the floor (presumably through which barrels of powder were hoisted).[6] That storage

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1. *Cal. SP Dom. 1547-88*, p. 196. During the seventeenth century this area became a liberty of the Tower together with the Old Artillery Ground and the Wellclose to the east. Both precincts had come into the possession of the Crown following the Dissolution and both attracted Ordnance occupation. For a general description see Lipman (1978), pp. 147-9.
2. Barter (1978), p. 108.
3. E 351/3203.
4. SP 12/141, f. 100.
5. WO 55/1673.
6. WO 49/19, f. 142.

space was in much demand is illustrated by the fact that material was also being held in officers' lodgings and even a cellar beneath the parson's house.

Payments for repairs and alterations to the various storehouses are recorded,[1] so too, in 1595, is the purchase of a large quantity of oak boards for making a new gun platform on top of the White Tower.[2] Elsewhere the Office craftsmen were frequently engaged in repairing three large cranes that the Ordnance operated on the Wharf and the houses allotted to the senior members of staff.[3] Of these the most important was that assigned to the Master of the Ordnance. This was situated in the Brick Tower behind the Long House of Ordnance, where it had been since the building was remodelled and enlarged in brick (hence its name) between 1510 and 1520.[4]

Lastly there are some references to the accommodation of the Ordnance administration at the Tower, with repairs being carried out in a clerks' office and an 'outer office' that presumably adjoined the 'inner office' first mentioned in the accounts a few years later.[5] These rooms almost certainly formed part of the office that is referred to as being near the Long House of Ordnance in 1564.[6] The building is probably the same office that the Ordnance vacated for more commodious surroundings in 1673 (see pp. 37-8 below). It occupied the area behind the Chapel of St Peter ad Vincula where two large brick undercrofts still survive. Most of the latter now form an amenity to the Chapel, part of the southernmost vault having been converted into the crypt during the nineteenth century. The date of the building is not known.[7]

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1. WO 49/18, ff. 92, 122 & 126; WO 49/19, ff. 14 & 145; WO 49/26, f. 207; WO 49/27, ff. 61 & 69; WO 49/28, ff. 174 & 178.
2. WO 49/19, ff. 225 & 228.
3. Crane repairs: WO 49/18, ff. 41 & 92; WO 49/23, f. 11; WO 49/24, f. 30; WO 49/27, f. 70; WO 49/29, f. 34. Accommodation repairs: WO 49/26, ff. 133-4 & 141-2; WO 49/27, ff. 61 & 68-70; WO 49/30, ff. 4-5 & 7.
4. Colvin, ed. (1975), p. 263.
5. WO 49/19, ff. 14 & 142; WO 49/25, f. 112.
6. SP 12/33, No. 63. It might also equate with the 'paiehouse' mentioned in regulations for the Ordnance dated May 1572, Barter (1978), p. 108.
7. The masonry wall that marks the eastern limits of the vaults and which appeared to be the lower part of the ground floor superstructure of the building, Parnell (1993), p. 58, has been shown by archaeological investigation in 1994 to be nineteenth-century pastiche.

(v) The expansion of Ordnance facilities at the Tower during the early Stuart and Commonwealth periods The growth of the Office's facilities at the Tower continued during this period and with an increasing amount of building work being carried out by the department itself. Noticeable activity can be detected in the White Tower during the first years of James I's reign with a floor being laid 'all the length' of the building in 1603-5 to provide a new powder store.[1] During the operation posts were installed to support the roof overhead. It is clear, therefore, that the work involved the insertion of one of the existing uppermost floors into part of the lofty suite originally intended for William the Conqueror.[2] The operation had evidently been planned well in advance since the boards were prepared two years earlier. It is possible that the undertaking was the result of a commission which had been set up in July 1598 with a long list of objectives that included an instruction to build a proper place in the White Tower for the storage of gunpowder.[3]

The work undertaken in 1603-5 is detailed in the Exchequer accounts, indicating that the author was the Office of Works. However, the growing influence of the Ordnance is recorded in payments made by the department in 1608 for fitting up and furnishing rooms in the White Tower for the storage of match and powder.[4] Work in the powder room included the laying of a boarded floor of Norwegian deals and the introduction of frames and shutters into nine two-light windows. The latter might identify the room as being the great western chamber on the first floor, which from cartographic evidence is known to have retained its nine pairs of Norman window openings until the late eighteenth century.[5]

The role of the Tower at this time as the principal powder magazine in the country is further illustrated by the construction in 1610 of a powder proof house, and a larger powder house, somewhere in the Mint.[6] The two brick buildings, paid for under the

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1. E 351/3239 & 3240.
2. Brown & Curnow (1984), pp. 66-8.
3. SP 12/268, f. 22.
4. WO 49/33, ff. 51, 87 & 97.
5. *Cf.* drawing by Francis Grose dated 1784, B.M., Crace Collection, XX-149.
6. WO 49/35, ff. 42-4; WO 49/36, ff. 25-6.

privy seal, were possibly the first of their kind to be erected by the Ordnance using its own warranted craftsmen. Apart from these buildings, and the two storehouses previously referred to, the Ordnance presence in the Mint included the forge and lodgings of their smith, who was established in the area by 1608,[1] and the workshop of the Master Bowyer, which is mentioned in a survey of 1604.[2] Finally, a large shed erected in the Mint in 1624[3] might have been a store for gun carriages mentioned in 1630[4] or that for shot referred to in 1642.[5]

In 1636 another part of the White Tower was converted into a powder store and a doorway punched through the external wall in order to allow supplies to be hoisted directly into the room from the outside.[6] It is possible that work was carried out in part of the building which until then retained a notional association with the old palace, for a curious inventory of royal lodgings drawn up in 1630 includes reference to a 'greate roome' in the White Tower located on the uppermost floor.[7]

During the Commonwealth period yet more facilities for storing gunpowder were provided when in 1650 the wardrobe built for Henry VIII between the Wardrobe and Broad Arrow towers was fitted up 'for the safe keepeing of the powder that is to be prooved' at a cost of some £233.[8] This development would seem to indicate the time when the proving of powder began in the large stone building attached to the east side of the White Tower (see p. 30 below), and perhaps the end of the practice started in Mint Street in 1610. Within the White Tower the accommodation continued to be shared by the Armoury and Ordnance offices with a survey taken in April 1650 listing the former having armour in the 'Lower Roome' and swords in the 'Upper Roome'.[9] In November 1654 the

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1. WO 49/33, f. 87; WO 49/48, f. 46.
2. WO 55/1674.
3. WO 49/54, f. 102; WO 49/55, f. 19.
4. WO 49/61, f. 72.
5. WO 49/77, f. 47.
6. WO 49/70, ff. 4-6, 73-4, 107-8.
7. West Sussex Record Office, Petworth House Archives, pp. 6-7.
8. As the consequence of an order from the Council of State dated 9 January 1650, WO 49/86, ff. 26-8.
9. Reid (1966), pp. 339-40.

Ordnance bricklayer was paid for sealing up several windows and doorways in the White Tower[1] and in August 1657 the carpenter received £126 for fitting up yet another convenient place in the building for the 'safe keepeing of a great quantity of powder'.[2] Perhaps this operation represents the occasion when the existing uppermost floor was inserted into the eastern chamber.

Apart from the facilities in the White Tower, the Long House of Ordnance erected during the reign of Henry VIII remained the principal military storehouse at the Tower. Throughout the first half of the seventeenth century the building was constantly repaired and maintained, though it was evidently finding the task of catering for the increasing storage needs of the Ordnance difficult. On 10 July 1639 the officers of the Ordnance petitioned the Privy Council for permission to convert the 'old hall' into a convenient storehouse for guns, carriages, match and other provisions, at an estimated cost of £300 or £400.[3] Though no locations are given it is tempting to identify this old building as the medieval great hall in Coldharbour, which in a report into the state of the fortress carried out while Sir Francis Jobson was Lieutenant of the Tower, and therefore dated some time between 1564 and 1570, was found to be ready to fall with most of the lead off the roof.[4] On the 1597 survey the building is shown as roofless and marked 'decay'd' (see Fig. 4 below) while in the summer of 1600 Baron Waldstein from Moravia described the ancient hall as almost falling to pieces with age.[5] No decision in favour of the Ordnance petition is reflected in the accounts, and in June 1641 the master carpenter, Mathew Banks, was paid £783.08s.04d for constructing a new storehouse in Coldharbour.[6] This was a three-storeyed, timber building which, with each floor comprising a surface area of 39 squares and a roof containing four principal trusses, perhaps occupied a modest ground plan of say 30ft x 13ft. The account indicates that the storehouse was erected on difficult ground by reason of the 'many vaults being formerly buried there'. The posts supporting the first floor were therefore made to rest on

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1. WO 49/87, f. 58.
2. WO 49/89, f. 234.
3. SP 16/425.
4. B.M., Add. MS. f. 41.
5. Goos (1981), p. 71
6. WO 49/72, f. 71. A further £42.11s.09d was paid for ironwork, *ibid.*, f. 70.

foundations of stone 6ft deep and 4ft square, which in turn were set upon timber piles. A notable feature of the building must have been its very steep roof, which, with 2ft wide eaves, was intended to maximise the storage potential of the attic floor. The storehouse was entered via a pair of great doors with a window set overhead. There were only three other (transom and mullioned) windows lighting the building, presumably one on each floor. Access between the floors was provided by a pair of 4ft wide staircases, while stores could be hoisted into the upper floors by means of a large crane operated by two men.

If the Ordnance experienced difficulty in securing sufficient storage space, the supply of residential accommodation was no less problematic. The Tower authorities, Yeoman Warders and a small army of officials working for the various government departments, all vied with one another for available accommodation. The situation was sometimes aggravated by an influx of state prisoners, who from time to time were detained in unlikely surroundings. For example, in March 1552 a letter was written to the Lieutenant of the Tower instructing him to remove Doctor Tunstall, late Bishop of Durham, from the newly erected Long House of Ordnance, as the said building was required by the officers of the Ordnance for their official duties.[1] The ceremonial role of the Tower could make additional demands, and as part of the preparations to receive James I and his entourage, before the coronation procession to Westminster on 15 March 1604, two rooms in the lodgings of the Ordnance Keeper of the Stores were fitted with wainscotting to help accommodate the Lord Chamberlain and other guests.[2]

In 1605, after deliberations with the Office of Works, a house previously occupied by the Constable of the Tower was substantially refurbished for the Surveyor of the Ordnance. The building is known to have stood against the inner curtain wall immediately south of the Constable Tower (see pp. 99-100 & Fig. 49 below), which presumably formed part of the accommodation at some stage, hence its name.[3] The account list repairs and

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1. *Acts of the Privy Council, Vol. IV,* p. 232.
2. WO 49/31, f. 101.
3. This may be reflected in a bill of repairs to the lodgings in 1637 which includes a reference to new flooring the 'Turret', WO 49/70, f. 240.

alterations to rooms on the lower floor comprising a great chamber, with study attached, hall and kitchen. Above were three chambers, with that over the great chamber having an adjoining closet and garret above.[1]

In 1606 a brick vault was added to a house occupied by the Clerk of the Deliveries,[2] which must have been situated near the western entrance since two years earlier it was described as being 'by the Lyons'.[3] The property belonged, in fact, to the Lieutenant of the Ordnance, but it is evident that he preferred to reside in another house provided for him in the Minories. In 1638 the house received further attention with stone fireplaces 'wrought fayre with Archatrave freez and Cornish' installed in the dinning room and parlour, two white fireplaces set up in the great chamber and upper chamber, and new Purbeck marble laid in the hall and kitchen.[4] Less than three years later, however, the house attracted more fundamental repairs with much of the timberwork, including wall plates, roof sections, floors, stairs and windows, being replaced at a cost of some £240.[5]

In 1622 the Bowyer's residence in the old medieval chamber block to the east of the Wakefield Tower attracted attention with £44 being spent on replacing stone windows and doorcases, supporting floors, erecting partitions and enclosing a staircase.[6] Four years later the Ordnance builders returned to repair the Surveyor's house by the Constable Tower, but on a far greater scale than that undertaken in 1605. An estimate for repairing the house, described as 'ruined & decayed', together with that of the Long House of Ordnance, came to £584.15s.00d, but in the event some £640 was spent on the Surveyor's lodgings alone.[7] As such this represents one of the largest expenditures on a single building at the Tower by the early Stuart Ordnance Office, for which additional monies were advanced under the privy seal.

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1. WO 49/31, ff. 79-80.
2. WO 49/32, f. 53.
3. WO 49/31, f. 11.
4. WO 49/75, f. 89.
5. *Ibid.*, f. 224.
6. WO 49/51, f. 117.
7. WO 49/57, ff. 142-5 & 147.

Among the regular small works of repair and maintenance to Ordnance lodgings is an intriguing reference in April 1642 to 'Necessaries done in the Kings Lodgeings within the Tower for the Master of the Ordnance'.[1] This would seem to suggest yet another incursion into what remained of the royal lodgings and probably indicates the moment when the Master of the Ordnance transferred from his traditional accommodation in the Brick Tower to the site he occupied in and about the Lanthorn Tower until the late seventeenth century (see pp. 98-9 below).

Repairs to the administrative office of the Ordnance appear in the accounts at frequent intervals and there are also references to the purchase of furnishings and equipment. In November 1606 the joiner was paid £13.17s.00d for making an exceptional piece of furniture described as a 'Wainscott presse with sundrie Cupboards, for placeing up of Journall bookes and other Recordes',[2] while in March 1642 presses, a table, cupboards and shelves were supplied for a room where 'the Modells lye next to the Office'.[3] In January 1654 an upholsterer was paid for supplying the office with six high back chairs in 'baken leafe collour' with a carpet to match.[4]

Most of the buildings occupied by the Ordnance, whether as stores or lodgings, required a regular supply of water. The accounts illustrate that the Office was not only preoccupied with meeting its own demands, but also those of other establishments within the fortress. In June 1630 the Office plumber, Joseph Day, was paid £25 for monies dispersed over the previous two years to a 'pomper of water to pump water in the waterworks at the Tower to serve the Lieutenants howse and the howses their belonginge to the Office of Ordnance and other the inhabitants there his Majesties servants and to have water alwaies in readiness to prevent the danger of fier which may at any tyme happen there by Casuality'.[5] In December 1612 an account was settled for tiling a new roof over the 'pompe by the watergate' which seems to indicate that by this date the waterworks was

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1. WO 49/77, f. 60.
2. WO 49/32, f. 138.
3. WO 49/77, f. 50.
4. WO 49/87, f. 97.
5. WO 49/61, f. 58; WO 51/1, f. 9. For subsequent payments in 1634-7, *ibid.*, ff. 47, 77 & 82; WO 49/70, ff. 211-2.

located in the basin below St Thomas's Tower, a site it was to occupy until the second half of the nineteenth century.[1] The origins of the installation probably date back to the middle of the sixteenth century and a great mill erected by a certain Mr Brooke referred to by the Lieutenant of the Tower and Controller of the Mint in a letter to William Cecil dated 1559.[2]

In June 1608 bills were settled for providing two new cisterns to store water from the Thames. One was located 'where the force first raiseth the water', the other by the White Tower.[3] The latter was the much larger of the two and might have been positioned on the roof of the stone building annexed to the east side of the White Tower (see Figs. 5 & 29 below). The state of the water supply was reviewed in a report on the Tower presented to the Privy Council on 31 December 1623.[4] Three options for improvement were considered. Firstly, the introduction of a new supply of water to be pumped from Thames Street, outside the fortress, to a new subterranean reservoir to be constructed between the Chapel of St Peter ad Vincula and the Long House of Ordnance. Secondly, to repair the system as it existed and, thirdly, to install one new large engine at the head of the supply with smaller devices along its course to maximise pressure and thus help force water up the vertical runs and into the cisterns. There is no evidence in the accounts to indicate that any remodelling of the water supply followed the submission of the proposals. Instead, it would appear that the existing arrangement was simply maintained and operated.[5]

Another task which preoccupied the Ordnance was the maintenance of its facilities on the Wharf. By the early seventeenth century much of the department's activity now centred on the western half of the embankment rather than on the eastern half as granted to them in 1452 (see pp. 13-4 above). At the end of November 1611 the Earl of Salisbury wrote

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1. Parnell (1993), p. 101.
2. SP 12/5, f. 3.
3. WO 49/33, ff. 54 & 56.
4. B.L., Harley MS. 5913, ff. 26-7.
5. It might also be worth noting that in December 1627, a certain John Cooke, engineer, received £17 for fitting a timber wheel to a pump employed by the Ordnance to combat fires so that it could be operated by one man, rather than three, WO 49/58, f. 335.

to the Lieutenant of the Tower, Sir William Waad, instructing him to erect a bar across the Wharf on the west side of the bridge in front of St Thomas's Tower in order to control the passage of carts through the area. Furthermore, to help disentangle the various landing and loading operations being undertaken on the Wharf, he recommended the setting up of a new crane on the Wharf 'confronfronting the Chief rooms in the Kinges Lodgings' [i.e. Lanthorn Tower]. Waad, however, notes at the bottom of Salisbury's letter that he managed to persuade the Lord Treasurer to abandon the idea because it was found to be inconvenient.[1]

In August 1626 an estimate of £203.13s.04d was submitted for replacing one of the three cranes that the Ordnance operated on the Wharf, after it was found to be ready to fall, and for repairing the two others;[2] by the end of December the following year the work had been carried out.[3] In April 1640 £327.13s.04d was spent on replacing a second machine,[4] and in 1643 part of the casing of the Wharf beneath the 'midle Crane' was repaired.[5]

In an age when low, angular, bastions offered the only protection against heavier and more accurate artillery, the medieval defences of the Tower were quite obsolete. No attempt had been made to cut down the tall mural towers to serve as gun emplacements during the sixteenth century, instead timber gun platforms were simply placed over the leads of a number of buildings.[6] Of these, those on top of the White Tower received regular repair during the reign of James I, with an exceptional expenditure of £340.18s.06d being recorded in March 1610. This included not only timber for staging,

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1. B.L., Add MS. 14044, f. 36.
2. WO 49/57, f. 139,
3. WO 49/58, ff. 246-7, 250 & 341.
4. WO 49/72, ff. 24-5.
5. WO 49/80, f. 25.
6. An estimate for new platforms in April 1564, lists devices on three of the towers along the northern inner defences, the four sides of the White Tower, two positions in the Mint (one being Legge's Mount or Brass Mount) and St Thomas's Tower, SP 12/33, no. 63.

but also timber for gun carriages and other necessities.[1] A similar, though less expensive, overhaul is recorded in March 1625.[2]

The poor state of the Tower's defences had been compounded towards the end of the sixteenth century by artisan incursions around the edge of the moat and up against the walls of the Bulwark at the western entrance. These encroachments formed the subject of a detailed letter of complaint from the Lieutenant of the Tower, Sir William Waad, and two chief officers of the Works in 1606.[3] A curious pictorial view of the Tower showing the extent of the encroachments was also prepared,[4] but the accounts reveal no evidence for any action being taken.

The condition of the Tower was again considered in 1620 by six members of the Privy Council. They expressed indignation and dismay at the extent of the encroachments, the condition of the fabric and the way that private interests were encouraging neglect.[5] Immediate orders were given to put the battlements in good order and to remove the powder magazine (presumably that in the White Tower) away from the Record Office and the Crown Jewels and a detailed survey called for. This was supplied at the end of December 1623, the authors being Sir Allen Aspley, Lieutenant of the Tower, Sir Richard Morrison, Lieutenant of the Ordnance and his immediate successor Sir John Ogle, though the substance of the report was probably the work of Bernard Johnson, the King's engineer.[6] One of the main issues in the report concerned the moat, the sides of which were encumbered with some two hundred and twenty houses, sheds, timber yards, coal yards, wheelers' yards and such like. The activities associated with these encroachments, together with the ebbing and flowing of the waters in the moat, caused considerable silting. The committee, therefore, recommended a major scouring of the moat, followed by the construction of a brick retaining wall around its outer edge. The estimated cost of the wall, which was to be 16ft high and 5-6ft thick, was £2378. Among the numerous

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1. WO 49/37, f. 22.
2. WO 49/55, ff. 63 & 109.
3. Hatfield House, Cecil Papers, 119, f. 160.
4. Parnell (1985a), pp. 66-9.
5. *Cal. SP Dom. 1619-23,* p. 160; B.L., Harley MS. 1326.
6. Colvin, ed. (1975), p. 275.

other recommendations contained in the report was the freeing of a continuous walk along the outer curtain wall for the 'rounders' or sentries and a re-disposition of ordnance along the north side of the fortress with batteries to be concentrated on Brass Mount ('the mount over the Blockhouse'), Legge's Mount, Devereux ('Dublin'), Bowyer and Martin towers.

Little, if any, action appears to have been taken on the Aspley report and it is not until the period leading up to the outbreak of the civil war that the accounts record a bustle of activity for the benefit of the defences. Events began on 15 May 1640 with an order from the Privy Council to the Lieutenant of the Tower instructing him to receive trained bands within the precincts of the castle and for a supply of arms and munitions to be prepared accordingly.[1] As part of the arrangements to receive the bands, William Batten, Surveyor of the Navy, was paid £81.03s.01d for covering huts with canvas to serve as temporary accommodation.[2] In October 1640 plans for the disposition of ordnance, including twenty-one cannon and three mortars on the White Tower, were being prepared together with instructions for the gunners.[3] The implementation of these plans is recorded in a series of payments, beginning in December 1640 when the Office mason, Richard Banks, received £151.00s.09d for constructing gun platforms.[4] In April the following year the carpenter, Mathew Banks received £546.14s.11d for assembling engines to haul guns onto the platforms, making gun carriages, mounting guns and for constructing 'a little house of Tymber and thicke Brick [and] Planckes [made] Musket proof on [the] Tower Wall for the Gunners defence'.[5] Finally, in May 1641 an account for £686.08s.03d was settled with the gun founder, John Browne, for casting eight pieces of brass ordnance to be mounted on the White Tower.[6]

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1. *Cal. SP Dom. 1640*, p. 167; *ibid.*, *1640-41*, p. 194.
2. WO 49/72, f. 55.
3. SP 16/469, f. 153; SP 16/470, ff. 49-50.
4. WO 49/72, f. 64.
5. *Ibid.*, ff. 65-6.
6. *Ibid.*, f. 68.

I. THE RECONSTRUCTION OF THE PALACE WARD

As outlined in the previous chapter, the increase in Ordnance storage facilities at the Tower during the Commonwealth era appears to have been confined to the creation of new powder stores within the White Tower and the nearby former royal wardrobe range. Prior to this, the last military store to be provided was the timber storehouse built in Coldharbour which the Office occupied in 1641. In the wake of the Restoration the situation was reviewed by the Privy Council early in 1661[1] and it is probably as a result of their deliberations that an important decision was made nearly two years later. A royal warrant dated 17 January 1663 recited:

> 'Whereas wee have received information of the great want of convenient Roomes in the storehowses belonging to the office of our ordnance within our Tower of London ... Our will and pleasure is ... that the void peece of ground within our said Tower comonly knowne or called by the name of the wardrobe Garden bee assigned ... toward the erecting and building of a Storehowse for laying up our said Armes and provisions'.

The storehouse was ordered to be built 'as soone as the season will permit', and 'to the best convenience and advantage the said ground will afford'.[2] During February and March the first of several imprests of money were made to John Scott, carpenter, and Thomas Norfolk, bricklayer.[3] In May 'Traitors bridge Gate', the tunnel through the Wharf before St Thomas's Tower, was ordered to be cleared to enable provisions for the new storehouse to be brought through the watergate and into the basin,[4] while in July the paving of a road to the new building, and a court before it, was ordered.[5] Further

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1. PC 2/55, f. 81; PC 6/18, p. 15.
2. WO 47/5, f. 3; PRO 30 37/14; Dart. MS. 1778 I.i. 112.
3. PRO 30 37/9, f. 14. For subsequent imprests, *ibid.*, ff. 15, 18 & 23.
4. WO 47/5, f. 30. This appears to be one of the earliest occasions when the term 'Traitor' is associated with the water entrance below St Thomas's Tower. See *ibid.*, f. 31 & PC 2/56, f. 204; PC 6/18, p. 42, for the Privy Council's warrant to the Lieutenant of the Tower instructing him to open the watergate as and when building materials were needed.
5. WO 47/5, f. 40.

impresses were made to the plasterer in October and the smith in November by which time the main body of the three-storeyed building had been raised.[1]

By July 1664 the principal accounts with the builders had been settled at a cost of just over £4000.[2] Shelves and presses were installed, racks for guns, ladles and sponges erected and hundreds of wooden pins provided to hang holsters. By the autumn 2232 yards of 'Broad Bullrush Matts' had been laid in the 'small Gunn Office Roome', next to the 'View Roome' and six furbishers paid for 'oyleing ffixinge and Cleaneing the Armes', which were removed from the White Tower and old Small Gun Office.[3] A few weeks later on 8 November Pepys surveyed the Tower storehouses in the company of the King and various officials, and considered that 'with the addition of the great Store house', they were 'a noble sight'.[4]

There can be no doubt that the new storehouse so expeditiously erected and equipped was in fact the present New Armouries Building which stands against the inner curtain wall between the Broad Arrow and Salt towers (see Figs. 1, 2 & 49 below). The earliest cartographic evidence for the building is found on the Ogilby and Morgan Survey of *c.*1676.[5] On the 1597 Tower plan the site is shown as open ground to the south of the range between the Wardrobe and Broad Arrow towers (see Fig. 4 below).

The New Armouries Building contains a series of polygonal and original carved columns which support the floors (see p. 131 & Fig. 6 below). There is a popular belief at the Tower that these derive from an earlier building, though nothing in the surviving accounts

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1. PRO 30 37/9, ff. 19 & 21.
2. WO 48/3, ff. 25, 32, 34-5 & 37-41.
3. *Ibid.*, f. 56; WO 51/4, ff. 78 & 81. For detailed inventories of the arms in the Small Gun Office and White Tower taken in September 1663 and February 1664, see WO 47/5, ff. 58-60 & 98-9. The rooms within the Small Gun Office, with the exception of the 'Round Roome', which was probably the ground floor chamber of either the Flint or Bowyer towers, must have been located within the Long House of Ordnance on the hill north of the White Tower. These are named as the 'further Room in the Small Gun Office next the Armoury' the 'first Roome where the Racks are' the 'presse Roome' the 'Inner Roome next the Round roome' and the 'Closset'.
4. Latham & Matthews, eds. (1970-83), Vol. V, p. 316.
5. R.A., Inv. No. I.73.7.

supports this view. In fact, whereas the bills of the mason and bricklayer specifically mention the reuse of old materials, those of the carpenter do not. Nor is there any documentary evidence to justify the assertion that the building was an early commission of Sir Christopher Wren.[1]

The New Armouries Building has no obvious architectural parallel in the extant remains, or surviving drawings, of post-Restoration Ordnance storehouses and thus it helps to illustrate the more flexible approach to building design that existed within the department until the early eighteenth century (see pp. 149-50 below). The Great Storehouse at Plymouth Citadel, built in stone to a design by Sir Bernard de Gomme in the late 1660s, is now its closest contemporary.[2] This, however, has a simple rectangular plan, as opposed to half E-shaped, and other than a similarity in size (i.e. 100ft x 48ft as compared to the main body of the Tower structure, which is 128ft x 43ft) shares few affinities. The three floors of de Gomme's building were formed beneath a roof of original M-shaped form,[3] while the third floor of the Tower storehouse is contained within a double pitched roof.

The next phase of Ordnance building work at the Tower was carried out to the west of the new storehouse in the heart of the old medieval palace, then loosely referred to as Coldharbour. The work was partly necessitated by the danger that various old buildings posed to the powder magazine in the White Tower. As early as March 1661 a committee of Privy Councillors had recommended that 'the Roomes at the two Corners of ColeHarbour ... contiguous to the White Tower' should be demolished to provide a safety corridor at least 20ft wide around the building. This, together with the pulling down of all the chimneys belonging to the Jewel House on the south side of the building, was ordered,[4] but there is no evidence to show that the work was actually carried out.

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1. Clapham (1913), p. 42.
2. Glass, ed. (1984) pp. 83-4.
3. Now replaced a double pitched one. A detailed survey of the building before its alteration was prepared by Christian Lilly in 1716, B.L. Kings MS. 45, f. 36.
4. PC 2/55, f. 81. For the background to the committee's appointment, *ibid.*, ff. 61 & 74 and PC 6/18, pp. 12-3.

On 5 March 1666 another Privy Council committee, which included Sir Thomas Chicheley, Master-General of the Ordnance, and Hugh May, the acting Surveyor of the King's Works, was instructed to 'consider of a place either within his Majesties Tower of London or without ... where with most safety and convenience his Majesties stores of armes and amunicon especially that of the Powder may bee placed'. In addition they were required to find a new route by which these stores could with most efficiency be conveyed in and out of the fortress without exposing the City to the danger that the existing passage of powder posed. The committee's findings were promptly presented on 21 March. The existing gunpowder proof yard within the great stone building annexed to the east side of the White Tower was judged to be 'most unsafe and hazardous' owing to the close proximity of the powder magazine. A new site on the Wharf was therefore considered to 'be very proper for the first landing and proveing of powder' which together with other stores could, via a new passage, be conveyed through Coldharbour and into the White Tower. In order to free the passage, as well as to provide better security for the powder magazine, various buildings near and about the White Tower, including what remained of the royal lodgings and houses belonging to the Lieutenant of the Tower, would have to be demolished. If this was done the committee estimated that at least 10,000 barrels of powder could be stored in the upper rooms of the White Tower with safety. If other stores were 'lodged there abouts altogether' the cost of transporting supplies to the Tower (then estimated at £1,000 *per annum*) would, it was argued, be considerably reduced, while the time taken to supply the fleet would be reduced from more than twenty to four or five days.[1]

The report was approved and authorised forthwith.[2] Work began after the Master-General Commissioners issued a warrant on 15 November 1666, an act that was to herald the start of nearly ten years of continuous building which would transform the old palace area almost beyond recognition.

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1. *Cal. SP Dom. 1665-66*, p. 331; WO 47/8, ff. 56-7.
2. *Cal. SP Dom. 1665-66*, p. 310; WO 47/8, ff. 66-7.

To free the new passage from the Wharf to the White Tower both the inner and outer curtain walls were ordered to be opened and a bridge made over the moat 'according to such forme and Moddell as Sir Bernard de Gomme his Majesties Principall Ingineer shall designe'. A second passage, presumably linked to the former, was ordered to be made to the 'Ordinary Proofe howse' on the east side of the White Tower. Accordingly `soe much of the Jewell howse as standeth in the way' was to be demolished. A third passage was to run 'out of Coldharbour through the old hall, and Garden behind it into the New Storehowse'. The east-west route to the new storehouse indicates that the old hall was one of the buildings associated with the Queen's Lodgings shown on the 1597 survey between the Wardrobe and Lanthorn towers, with the Wardrobe Garden lying to the east. To safeguard the powder magazine in the White Tower it was ordered that, 'all the Chimneys of the howse belonging to the Surveyour of the Workes and those of the Lodgeing in Cole Harbour Gate, and those in the White Tower adjoyning to the Staires Case goeing upp to the old Chappell as likewise those of that part of Jewell Howse which shall bee left standing and the howse of William Masters Wardour ... bee demolished and noe fires hereafter made therein'. Finally, it was stated that the Masters of the Ordnance 'may convert and appropriate all the Lodgeings Cellars & Vaults within Coleharbour, & thereabouts for the more convenient Lodgeings of his Majesties Stores of warr together, and for the use of his Majesties Ordnance'. To this end the officers of the Ordnance were to 'forthwith sett on Worke & employe such & soe many Workmen, and Labourers as shall be found necessary ... with that diligence and expedicon that is requisite in a thinge of soe great concernment'.[1]

The removal of the potentially dangerous chimneys began within days of the warrant being issued,[2] and during the following months some of the old buildings, including the 'great Hall' were pulled down.[3] During March and April 1667 imprests of money were made to Thomas Case, carpenter, and James Lloyd, mason,[4] for the construction of a drawbridge and gate whose position can be identified on a contemporary survey as

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1. *Cal. SP Dom. 1666-7*, p. 261; WO 55/332, pp. 119-20.
2. WO 51/8, ff. 21-2.
3. WO 48/9, p. 488; WO 51/11, f. 38.
4. WO 55/332, pp. 125 & 130; R.A., Inv. No. I.219.

corresponding to that of the existing nineteenth-century Middle Drawbridge to the east of St Thomas's Tower (see Fig. 46 below). The carpenter had in fact begun his work the previous December. By the middle of June the bridge was in position,[1] with the bricklayer being paid for making good the curtain wall either side of the gate later that year.[2]

Amidst this activity another royal warrant was issued on 22 April 1667.[3] It read: 'Whereas wee have found fitt some time since ... to authorise and direct severall demollishments & alteracons to bee made in and about our Tower of London, which hath allready in some measure been put in execution ... Wee have thought fitt suitable to those our first Intentions and directions ... that forthwith you give Order for the demollishing altering and new building all that grownde and ould buildings in the Tower called Cold Harbour'. This was defined as the area 'Included by the walls passing from the White Tower, to the Bowers Tower, and soe to the Mote on the west [sc. south] side, and by the way leading from the Hill by the new store house, downe to the Lower Garden on the East side (excepting one pile or Tower neare Cold Harbour Gate, with the staire Case reserved for the Jewell house)'. The 'Bowers Tower' close to the White Tower evidently relates to 'Nunn's Bower' listed in an inventory of about 1641 as the 'prisons over Coleharbour Gate'.[4] In March 1669 the Office of Works, who were responsible for the maintenance of the lodgings within the gate, were engaged in 'making cleane the Leads over Nunns Bower', and during the following November obliged to dismantle the top of the 'Tower goeing into Coleharbour' after the 'ffall of Stones from Nunns Bower'.[5] It might be supposed, therefore, that Bowers Tower was one of the twin flanking towers protecting the gate. The reference to a tower connected with the Jewel House presumably refers to the slender tower seen on the 1597 survey attached to the west end of the building, which has been identified as the 'Ludwyktoure' mentioned in an account

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1. WO 48/9, p. 496; WO 51/10, ff. 99-100. For the ironwork, *ibid.*, f. 25.
2. WO 51/9, f. 58. For the Master-General Commissioners' warrant to the Lieutenant-General of 1 November 1667, WO 55/332, p. 209.
3. *Ibid.*, pp. 140-1; *Cal. SP Dom 1667*, p. 52.
4. B.M., Add. MS. 14044. Printed by Britton & Brayley (1830), p. 228.
5. WORKS 5/13.

of 1399.[1] Finally, the 'Lower garden' below the new storehouse must be the 'Privy Garden' again marked on the 1597 survey to the south of the inner curtain wall (see Fig. 4 below). Within the defined area, using lead, timber, brick and stone taken from the demolished buildings in Coldharbour and the 'houses and buildings upon the hill called the ould storehouse and Office', was to be 'erected such new store-house and buildings ... as you shall Judge most convenient and usefull for Our service'.

On 27 November 1667 the Master-General Commissioners were instructed to 'meete with all convenient speed, & give immediate Order for pullinge down & demolishing all Houses & Buildings, wherein any ffire Hearths, Chimneys, or stores, within such distance of the White Tower ... as they (in their opinion upon view thereof) shall conceive may any waies endanger his Majesties Magazine of Powder there'.[2] Subsequently, on 3 April 1668, the Commissioners presented the Privy Council with a report outlining twelve further measures deemed necessary to safeguard the magazine.[3] The document is of considerable interest for it provides an impression of some of the little-known buildings contiguous to the south face of the White Tower. It was argued that part of a house occupied by a Yeoman Warder close to the 'stone Tower adjoyning to the Place where the Powder is proved' [i.e. Wardrobe Tower] should be pulled down together with `the Roofe & Chamber of the Old Hall ... scituate betwixt the Jewell House, & the rest of the Kings Lodgings ... Leaving only the stone Walls standing, it being the Length of ffourty ffoote'. Another house occupied by a Yeoman Warder, part of the Jewel House which adjoined it, the 'Square Tower ... adjoyning to the White Tower, called Square Tower' and the 'Tower Prison at Cold Harbour Gate on both sides' should be emptied of all combustible materials, have their hearths and chimneys sealed and be boarded up. The remainder of the Jewel House, where the Keeper of the Jewels lived, and the 'House belonging to the Surveyor of the Works adjoyning to the West side of the White Tower', were recommended to be pulled down. The Commissioners argued that existing walls on the east and west sides of the White Tower should be extended to form a corridor around the building (and proof yard enclosure to the east), so that 'the Tower may stand clear from

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1. Colvin, ed. (1963), p. 728.
2. WO 55/388, pp. 189-90; PC 2/60, f. 34.
3. PC 2/60, f. 127; PC 6/18, ff. 123-4.

any Persons coming near it', thus reviving the proposal put forward in 1661 (see p. 29 above). Finally, it was stated that any buildings left standing within the new precinct should 'herefater be & remaine within the Office of Ordnance'.

The implementation of the latest proposals seems to have begun with Sir Gilbert Talbot, Master and Treasurer of the King's Jewels, being requested by the Ordnance to remove the jewels and plate out of the Jewel House to allow a speedy demolition of the building. Talbot complained to the Privy Council that there was no alternative accommodation in the Tower either for the Regalia or for the servants who attended it. As a temporary measure, therefore, he was assigned 'a Chamber without a Chimney in the Round Tower' in which to store the Regalia[1] - evidently a reference to the tower attached to the old Jewel House, for on 27 January 1669 the Board ordered twenty-four iron bars to be made for the 'Jewell house now fitting & makeing up in the Roome of the old Jewell house ordered to be pulled downe'.[2] Permanent accommodation was to be provided in the 'Irish Tower' [i.e. Martin Tower] and by December 1668 the Ordnance builders had begun work on its conversion.[3] The jewels were to be housed on the ground floor with the Jewel Keeper's apartment in the chamber above, which was enlarged with the insertion of a mezzanine floor (see p. 134 below). On 17 June 1669 the Board ordered work to be completed with all speed, and the Jewel Keeper, Talbot Edwards, to be moved out of Coldharbour and his house sealed up. At the same time a house next to the White Tower, and close to Coldharbour Gate, was ordered to be pulled down and the gate itself 'shutt up and noe body suffered to come in to Coldharbour'.[4] On 29 April, the Board contracted a certain Robert Paine of Harwich to supply three hundred and fifty rails, two hundred posts and three thousand 'Pallizadoes' 9ft long for the perimeter fence around the White Tower.[5] By the middle of June work on the brick wall and surmounting palisade was under way; by the end of October the fence had progressed sufficiently to allow a

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1. PC 2/60, f. 151.
2. WO 47/19A, f. 83. Evidently this was the 'brick Tower' provided with a new window in 1663, see WORKS 5/4, entries for October and December.
3. WO 51/10, ff. 98, 105-6 & 121; WO 51/11, ff. 38-9.
4. WO 47/19A, f. 186.
5. *Ibid.*, f. 148.

section of it to be painted lead colour by Thomas Bayley the Office painter.[1] By the beginning of 1670 three new Warders' houses to replace those confiscated in Coldharbour had been built in the Irish Mint[2] against the outer curtain wall some 100ft north of the Develin Tower (see Fig. 3 below).

For reasons which are not apparent it was decided at this time to abandon the new supply route from the Wharf to the White Tower and between December 1669 and October 1670 the master carpenter, Thomas Case, was engaged in dismantling the drawbridge he had erected to the east of St Thomas's Tower only two and a half years earlier.[3] The breach in the curtain wall was made good[4] and several years later the bridge was ordered to be sent to Portsmouth for reuse in the fortifications at Gosport.[5]

During all this building activity there is no obvious reference to the timber storehouse erected in Coldharbour in 1639 (see pp. 19-20 above). It did not survive to form part of the reconstructed complex and must, therefore, be seen as a rather ephemeral structure that probably fell victim to the demolitions of the 1660s. The appetite for more storage space, however, had not diminished and in 1670 the first of several bills were settled for the construction of a new, two-storeyed, storehouse in Coldharbour. The building backed against the residence of the Ordnance Treasurer and must, therefore, have been one of the two named storehouses shown on the 1688 bird's eye view - the 'Little Storehouse' located to the north of the Wakefield Tower and Treasury building or the much larger 'Mortar Piece Storehouse' to the east (see Fig. 55 below). Surviving building accounts indicate that the new building was a relatively modest affair. The brickwork for instance 'amounting to by measure the Doore wayes & windowes deducted', came to only `34 Rodds 232 ffeett'.[6] The size of this bill and others[7] appears inconsistent with the

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1. WO 51/10, f. 127; Bricklayer: *ibid.*, f. 124; WO 51/12, f. 18; Carpenter: WO 51/11, f. 57.
2. WO 48/9, p. 488.
3. WO 51/12, ff. 7 & 164.
4. *Ibid.*, f. 146.
5. WO 55/391, f. 173, per order of the Board dated 7 June 1678.
6. WO 51/12, f. 52; WO 48/11, p. 11.
7. Carpenter: WO 51/13, f. 18; Plasterer: WO 51/17, f. 51; Plumber: WO 48/12, p. 3.

demands of raising a major structure like the Mortar Piece Store, the north wall of which in any event is known to have been constructed in stone (see p. 64 below), and it is probable therefore that the new building was in fact the 'Little Storehouse' situated against the old medieval curtain wall north of the Wakefield Tower (see Fig. 2 below). Moreover, there are separate reasons for regarding the Mortar Piece Store as a building of much greater antiquity (see below). The new building appears to have been near completion by the end of 1671, and between 30 March and 4 May following the master carpenter was fitting up a train of artillery within.[1] A ground plan dating from 1715 shows the building to have comprised seven bays with an overall length of 72ft and a maximum depth of 28ft; a square stair turret attached to the northern elevation provided access to the upper floor (see Fig. 8 below). A small building located immediately north of the stairs and labelled on the 1715 plan as 'Browne's House' is almost certainly the porter's lodge at the entrance to Coldharbour, which was extensively refurbished by the Ordnance between March and June 1673.[2]

The earlier Ordnance storehouse in Coldharbour, now referred to in the accounts as the 'Old Storehouse' or 'Great Storehouse' was subject to repairs and alterations during this period, including, in September and October 1672, the removal of walls at the east and west ends and breaking out new window openings.[3] There seems good reason to suppose that the main body of the building did, in fact, comprise the remains of the medieval great hall. On both the 1682 plan (see Fig. 49 below), where it is labelled 'Graineery' and the 1688 bird's eye survey (see Fig. 55 below), where it is described as the `Mortar Piece store',[4] the storehouse is seen to occupy the same site as the ruinous hall depicted on the 1597 plan. The hall is known to have contained a row of windows along the south elevation which was either altered or repaired in 1443-4.[5] The top of this fenestration can be seen protruding above the inner curtain on the fifteenth-century miniature in the

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1. WO 51/15, f. 7.
2. WO 51/17, f. 168.
3. WO 51/15, f. 131.
4. The building appears to have acquired this name after the Board ordered 'All the Morterpeeces to be lodged in the Old storehouse in Cold Harbour' in July 1685, see WO 47/15, f. 87.
5. Colvin, ed. (1963), p. 729.

British Museum[1] and also, as it seems, on a Hollar engraving of about 1647.[2] A large window with a pointed arch can also be seen in the south wall of the building in an engraved view of the Tower from the river dating from *c.*1710 (see Fig. 9 below). The four windows probably account for the same number of large recesses shown in the south wall of the structure at ground and upper floor levels in plans dating from the first half of the eighteenth century.[3] The same plans indicate that the main body of the structure was approximately 70ft square with walls between 4ft and 7ft thick. The presence of further massive masonry in the heart of the adjacent Ordnance office and Constable's lodgings suggests that the hall, or some form of appendage, had once extended as far east as the Lanthorn Tower and the line of the east curtain wall. Whatever the full extent of the hall and its adjacent buildings it is apparent that in the south-east corner of the Inmost Ward substantial vestiges of the old medieval and Tudor palace were incorporated into the new Ordnance complex.

Elsewhere all trace of the old palace seems to have been eradicated. Though the general course of demolition can be traced, few of the accounts identify the actual buildings involved, a notable exception being the destruction between January and March 1670 of the 'old Powder House' or 'long powder house',[4] that had been converted out of the former Wardrobe range east of the Wardrobe Tower in 1650 (see p. 18 above). To compensate for this loss, part of the large stone building annexed to the east side of the White Tower was turned into a powder store, a conversion that included the introduction of an internal staircase.[5]

During 1672-3 the builders were busy working on a new administrative office for the Ordnance in Coldharbour to replace their old one behind the Chapel of St Peter ad Vincula, north-west of the White Tower.[6] The T-shaped building, which had one of its

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1. Parnell (1993), Plate 1.
2. Hind (1922), Plate XXXI.
3. *Cf.* WORKS 31/182 & 183.
4. WO 48/11, ff. 22-3; WO 51/12, ff. 26-7.
5. *Ibid.*, f. 148; WO 51/13, ff. 18-9.
6. Carpenter: WO 51/15, f. 211; WO 51/17, ff. 113-4 & 149; Bricklayer: *ibid.*, ff. 59, 117 & 168; Glazier: *ibid.*, f. 150; Ironmonger: *ibid.*, f. 113.

gables fashioned by the carpenter in an 'Italian' manner with enrichments, was located at the east end of the Mortar Piece Store and immediately to the north of the Lanthorn Tower and its adjoining medieval chamber block (see Fig. 2 below). It was not so much a new building, but the adaptation of an old one, as the core of the structure comprised part of the old Queen's Lodgings. A bill for preliminary work mentions taking down the piers of six windows and part of the 'front next the Garden' (presumably the east elevation overlooking the Wardrobe Garden), taking down three other windows, making holes for five new ones and levelling the 'inward Court' (possibly the courtyard located between the Mortar Piece Store and the office).[1] By the beginning of April 1673 the carpenter was being paid for boarding the floors and roof, erecting partitions and installing a pair of great staircases. The bill with the mason settled in October later that year lists the components of what might have been two external entrances in the form of four columns with capitals and pedestals and two engaged columns with capitals and half pedestals. A staircase of compass stone was probably associated with the larger of the two entrances and perhaps the elaborate stone carving of arms of the Ordnance which still survives at the Tower (see Fig. 7 below). Together they are likely to have formed the principal entrance into the building which may be seen against the north front of the office in plans dating from the late seventeenth century (see Figs. 10 & 49 below), but for which no elevational view has been found. Elsewhere within the building the mason installed stone bases under two doorcases, set up a white marble chimney piece and fitted the hearths of two others with polished Purbeck marble.[2] The joiner's account, settled at the same time as the mason's, lists rooms assigned to three senior officers of the Board and four named clerks. In addition there was a general 'Clerkes Room', and a 'Great Roome' with an 'Anteroome' attached. The Great Room and the anteroom were fitted with three sash windows each (a device only recently introduced into England so that it is perhaps not surprising that they were especially noted in the account); presumably the other rooms were lit by more conventional casements. Most of the rooms were wainscotted and all were provided with varying combinations of desks, tables, cupboards, presses, shelves and screens.[3] Among the items listed in the upholsterer's account are

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1. WO 51/15, f. 131.
2. WO 51/17, f. 63.
3. *Ibid.*, f. 43.

coverings for four benches arranged about a great table and thirteen large desks for clerks. Four 'Elbow Chaires of the fine Paris with a Twisted Frame', together with fourteen matching high back stools and four of the 'Ordinary Paris with a Turned frame' were supplied as well as twelve 'greene broad cloth chaires with turned railes and Silke Fringe'. Also listed is an expensive turkey carpet of 10½ yards priced at £21 and a 'Muskeete' carpet priced at £3.15s.00d. Finally, seven window curtains made of calico were provided and three of green serge for the Great Room.[1]

The construction and equipping of the new building must have been completed by the end of September 1673 when the officers and clerks were instructed to 'remove all their Bookes, papers and writetings to the new Office in Coldharbour ... without ffayle'.[2] With their office completed the Board embarked upon the next stage of the works programme, the demolition of all the remaining old buildings contiguous to the south side of the White Tower and evidently what remained of the range north of the new office. During July 1673 they had ordered that all the old stores in the 'Bishopps Lodginges old Jewell house or other storehowses over again the New Office', were to be removed.[3] On 10 March 1674, the Ordnance Surveyor-General, Sir Jonas More, was instructed to prepare a contract for 'pullinge downe the Tower against the White Tower'.[4] This is probably the same building referred to as the 'Square Tower' in the Privy Council report of April 1668 (see p. 33 above), and is thus likely to have been the early medieval forebuilding which stood against the west end of the south wall of the White Tower, described as the 'Kings Lodgings' in 1647 when a sketch of its floor plan was made.[5] On 24 March 1674 a 'Great Screw for Clearinge downe the Ruinous Walls next the White Tower' was ordered onto the site, followed by timber for staging, tackle and other

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1. WO 51/19, f. 115.
2. WO 47/19B, f. 18.
3. *Ibid.*, f. 8. The reference to the Bishop's Lodgings is enigmatic. An earlier reference in the Board's minutes for December 1668 mentions the 'Bishopps hall' (WO 47/19A, f. 63) but gives no indication of its position. It is possible that the Bishop of London, in his capacity as chaplain to the monarch, was formerly provided with lodgings in the Tower in the same way that he was accommodated in the palace at Whitehall, see WORKS 5/2, matlayers account dated April 1661.
4. WO 47/19B, f. 39.
5. Turner & Wright (1934), p. 26.

equipment to facilitate demolition.[1] The operation appears to have been completed by August when several heaps of stone were ordered to be taken off the site so that work on the palisade around the White Tower could be continued.[2] During demolition considerable interest and publicity was aroused when, on 17 July, the remains of two small children believed to be the 'Little Princes in the Tower' were discovered apparently under the stairs which led from the forebuilding to the chapel in the White Tower.[3]

There now remained only one major task to complete the Ordnance reconstruction of the palace ward - the removal of the Coldharbour Gate itself, the original entrance to the ward by the south-west corner of the White Tower (see Fig. 4 below). On 16 September 1675 the lead over the gatehouse was ordered to be sent to Greenwich to cover the roof of the Observatory then under construction.[4] On 18 November a team of ten labourers was contracted to demolish the gate for the sum of £40.[5] Dressed ragstone and other materials were retained by the Ordnance for future building work while a large quantity of coarse rag was sold for £60.[6] The account for pulling down the gate was settled on 31 March 1676,[7] and on 11 July the Board ordered an estimate to be prepared for completing the palisade about the White Tower with 'another pallizade Gate att the West side of the White Tower as is already att the East syde' (see Fig. 49 below).[8] Subsequently, on 31 July, an account with the paver was settled for paving along the east, west and south sides of the White Tower.[9] With the south and west fronts of the great tower now free of accretions for the first time in nearly four hundred years, the mason, John Thompson, was contracted on 1 August 1676 to repair the exposed external elevations, thus completing a process that had begun forty years earlier.[10] By the end of November that year the quoins of two buttresses on the west front together with those along the south front had

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1. WO 47/19B, ff. 42 & 44.
2. *Ibid.*, f. 55.
3. Turner & Wright *(1934)*, pp. 8-11.
4. WO 47/19B, f. 91; WO 55/391, f. 120.
5. WO 47/19B, f. 97.
6. *Ibid.*, ff. 101 & 105.
7. WO 51/18, f. 184.
8. WO 47/19B, f. 117.
9. WO 51/18, ff. 228-9.
10. Colvin, ed. (1975), p. 276.

been renewed with Portland stone and the ragstone rubble in and between the buttresses repaired and repointed, while a new stone staircase of twenty-five steps was constructed against the south face to provide an independent access to the Record Office in the chapel on the first floor.[1]

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1. WO 51/19, f. 64. This is evidently the staircase shown on an elevation of the White Tower published by the Soc. of Antiquaries in *Vetusta Monumenta*, Vol, 4 (1815), Plate XLII.

II. THE DEFENCES AND THE GARRISON

The reign of Charles II witnessed very considerable efforts on the part of the Ordnance to modernise the defences and improve the accommodation of the garrison. But as with earlier attempts, the scope for improvement was governed by the nature of the medieval fortifications and by the enormous pressure on available space within the walls. From time to time the Ordnance engineers considered ambitious schemes for equipping the outer defences with large angular bastions to provide a proper artillery trace (*cf.* **III**, p. 158 & **XII**, p. 162 below), but in the event these plans never progressed beyond the drawing board.

In the wake of the Restoration the issue that caused most concern was the silted condition of the moat allied with the continuing problem of encroachments along its bank and against the Bulwark at the western entrance. After carrying out a personal inspection, the Duke of Albemarle recommended the removal of some of the offending structures and the cleansing of the moat. The Earl of Southampton referred the matter to the king on 5 December 1663 'because of the importance of the place' which he described as 'almost your single Magazine' (see Appendix A, p. 176 below), but no immediate action appears to have been taken. Within the walls many of the gun platforms, gun carriages, soldiers' lodgings and guard-houses were so decayed that the Lieutenant of the Tower, Sir John Robinson, felt compelled to petition the king on 4 December 1663.[1] Later that month an estimate of repairs was presented to the Privy Council and during February and March the following year the Board ordered the Office carpenter, bricklayer and mason to carry out remedial works.[2] The account with the mason refers to the laying of some 2565 feet of Purbeck stone paving on Brass Mount and the 'Mount next to Tower wharfe' to bear the burden of the guns.[3] It is highly unlikely that the second bastion, which also had earth introduced into it to raise the level of the platform, was the Lion Tower at the west end of the Wharf, as the core of that structure contained accommodation for the king's beasts.

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1. PC 2/56, f. 329; WO 47/5, f. 77.
2. PC 6/18, p. 57; WO 47/5, ff. 94 & 103.
3. WO 51/5, f. 79.

The building, cannot be positively identified, though it might have concerned the Develin Tower on the extreme south-east corner of the defences.

The 1664 Commission In January 1664 the Privy Council established a large commission to ascertain, amongst other things, what encroachments had been made upon the Wharf, moat, walls, and gates; to report on how the moat could be cleansed and enlarged; to examine the defects in the walls and obstructions along the tops of the walls, and to recommend where ordnance could be planted for the better defence of the Tower `towards the landside'.[1] The commission appears to have been slow in carrying out its investigations; it failed to make recommendations by 13 June 1664, the date of its expiry, and therefore had to be reconstituted during the following month in order to complete its deliberations.[2] Evidently this had not been achieved by September when the commissioners were instructed to report on a dispute involving access on to the Wharf.[3] After this date the activities of the commission fall from view and no apparent reference to a report appears in either the Privy Council registers or state papers. Whatever recommendations were made, it is very doubtful whether they were acted upon and the accounts provide no evidence of expenditure on the Tower defences at this time, other than small sums associated with general maintenance.

Sir Bernard de Gomme's Proposals of 1666 The perennial problem of encroachments was finally resolved in a dramatic manner in September 1666 when the offending structures were summarily demolished to prevent the flames of the Great Fire from reaching the fortress.[4] The Gentleman Porter, who it appears was largely responsible for the leasing out of plots of land around the moat, was eventually compensated by the Ordnance for the loss of his rents in 1675.[5] In the wake of the conflagration the Office evidently

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1. WO 49/112; *Cal. SP Dom. 1663-64,* p. 520.
2. *Ibid.*, pp. 611 & 633.
3. *Cal. SP Dom. 1664-65*. p. 7. WO 51/11, f. 36, for payment of £500 to the Lieutenant of the Tower for the loss of his mooring rights.
4. PC 6/18, pp. 103-4. For payments to the Lieutenant of the Tower and others, *Cal. Treas. Books, 1667*, p. 161; *Cal. SP Dom. 1666-67*, p. 582; WO 51/7, ff. 158 & 169; PRO 30 37/16. See PC 2/60, ff. 84 & 97 for petitions of inhabitants.
5. WO 51/18, f. 90. The practice of leasing evidently began in the late sixteenth century, Hatfield House, Cecil Papers 119, f. 160.

considered it opportune to review again the state of the Tower's defences and between 20 and 24 November 1666, Sir Bernard de Gomme, their Chief Engineer, was 'makeinge a draught of [the] Tower and designe of fortifieing the same'.[1] A surviving plan of the Tower, drawn by de Gomme at this time, shows that he proposed to revet the three landward sides of the moat with a new wall, thus resurrecting the scheme put forward in 1623 (see p. 25 above), replace much of the western entrance with a great ravelin and rebuild the old Postern Gate at the southern extremity of the City wall to the north of the Tower and the wall and gate at the eastern end of the Wharf (see Fig. 46 below). De Gomme may also have considered more radical designs, with a surviving plan, evidently in his hand, showing the addition of massive artillery bastions along the landward sides of the fortress (see Fig. 47 below). In April 1667, de Gomme was back at the Tower 'stakeing out the Graft' so that it could be 'inlarged & deep'ned'[2] but in the event another three years were to pass before work actually began (see below).

Further light on de Gomme's proposals are contained in an order in Council dated 11 August 1669 in which the construction of a 'Gallery ... behinde the Lyons Tower' is referred to.[3] Presumably this formed part of the proposals for reforming the western entrance, but like the planned ravelin and the new Postern Gate to the north, no further reference is known and there is no reason to suppose that the structure was actually built. The Council was concerned to see an estimate of the works prepared, but in the meantime expressly directed that the walling up and securing of the Iron Gate and 'Old Byward' on the south-east corner of the defences and the 'plaineing & Levelling [of] the Place called the Bulwarke' should be completed. Demolition of the Bulwark had in fact begun by November 1668[4] and during the following year large quantities of bricks were being carted off the site.[5] Between 21 November and 22 December 1670 the bricklayer was engaged in 'taking downe the outward great gate into the Bulwarke',[6] presumably the principal entry located on the north-east corner of the enclosure (see Fig. 4 below).

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1. WO 51/8, f. 23; WO 49/98, f. 200.
2. WO 51/9, f. 22.
3. WO 55/426, entry 129.
4. WO 48/9, p. 488.
5. *Ibid.*, p. 477; WO 51/10, f. 114; WO 51/18, f. 98.
6. WO 51/12, f. 158.

During 1670 a new wall and gate was constructed to the north of the Lion Tower on an east-west alignment approximately on the line of the extant entrance railings. During March the bricklayer was laying the foundations and building up the piers of the gate[1] while trenches were being dug for the footings of the adjoining wall.[2] By July the work was largely complete with William Fitch being paid for 'the new Gate ... the ffront thereof being rub'ed Bricks Gauged & Bedded one ffoote deep' and the 'wall from the New Gate ... downe to the Ditch & turneing by the Ditch to the midle Gate'.[3] The new enclosure, depicted in the Spilberg view of *c.*1690 (see Fig. 52 below),[4] was an unpretentious brick structure with stone dressings to a simple gate-way with semi-circular arch and oculi above - far removed from the ambitious ravelin de Gomme had advocated after the Great Fire,[5] and as far as the gate-way is concerned nothing like the impressive entrances that de Gomme introduced at Plymouth and Tibury.[6]

Between July 1670 and December 1672 some of the long awaited improvements to the moat were carried out with the north and west banks being cut back and revetted with a substantial brick wall. The operation involved considerable expenditure and labour costs alone accounted for some £3000.[7] To combat adverse ground conditions, elaborate foundations of timber and brick were laid in a trench 7ft deep and 7ft wide which contained four hundred and ninety-seven timber piles driven-in at 12 shillings a piece. The main body of the wall was strengthened with buttresses to the rear, themselves braced with timber anchors, while drains and culverts were incorporated at the base of the

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1. WO 51/12, f. 27.
2. WO 48/9, p. 519; WO 51/12, f. 61.
3. WO 48/11, p. 21; WO 51/12, f. 52.
4. Also on an eighteenth-century water-colour in the B.M. by an unknown artist, Crace Collection, Supplement, XX-35.
5. For reasons which are not readily apparent, parts of the fifteenth-century Bulwark were left standing to the north of the new enclosure (see Figs. 10 & 52 below) and in October 1675 the Board authorised the 'stoppinge up [of] the Gapp of the wall of that parte of the old Bulworke goeinge into Thames Streete' and the 'Repaire [of] the Wall in several places with out the Gate', see WO 47/19B, f. 93.
6. Saunders (1989), pp. 90 & 99.
7. Groundsmen: WO 51/12, ff. 48, 107, 146-8; WO 51/13, ff. 37, 43, 46, 48, 55, 79, 100; WO 51/14, f. 40; WO 51/17, f. 14. Carpenter: WO 51/17, f. 4; WO 51/21, f. 72. Bricklayers: WO 51/14, f. 55.

masonry to allow water egress. The laying of foundations in wet and hazardous conditions was permitted by some engineering ingenuity, with temporary dams being thrown across the moat to produce contained areas in which the water table could be lowered using pumps and scoops.

The Accommodation of the Garrison There is no evidence for the existence of any purpose-built lodgings for the garrison in the years immediately before and after the Restoration. Instead soldiers were simply quartered in whatever buildings could be made available. By 1660 the principal lodgings appear to have been in the 'Long Gallery' situated immediately west of the Salt Tower.[1] As part of the former royal lodgings, the maintenance of this structure was the responsibility of the Office of Works, though other buildings occupied by the garrison were repaired by the Ordnance. This shared task seems to have continued until 1668 when the last entry for such work is listed in the Office of Works accounts for September,[2] thereafter the Ordnance assumed sole responsibility. It is probable that this development was linked to warrants issued in March and April the previous year which, amongst other things, empowered the Master-General Commissioners of the Ordnance to be accountable for any repairs that had been made to fortifications since the Restoration (see p. 4 above).

As a consequence of recommendations presented to the Privy Council, a royal warrant was issued on 16 April 1667 authorising new accommodation for the Tower garrison to be provided in the Mint against the curtain wall between the Salt and Broad Arrow towers (see Fig. 3 below).[3] Nine days later a detailed design of the proposed lodgings was ordered to be brought to the Tower for the Board to examine. The drawing was intended to show the plan of the new building superimposed onto that of a structure already on the site, together with an expression of the ground level.[4] It was not until January 1669 that preparations for construction were actually put in hand, with £100 being

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1. WORKS 5/1, *passim*.
2. WORKS 5/11, 'Bricklayers employed ... in the soldiers quarters where was formerly the kings lodgings'.
3. WO 55/322, p. 141.
4. WO 49/112.

impressed towards the demolition of the old buildings and the construction of the new one and a contract ordered to be drawn up to scarp and remove soil from the site.[1] On 27 May orders were placed with the Office bricklayer and carpenter to begin construction 'according to the pattern' presented to the Board that day by Jonas More, the Assistant Surveyor,[2] though it is not clear whether this was the same design prepared two years earlier. The building appears to have been ready for occupation by the end of the summer in 1670 when the account with the carpenter, Thomas Case, which included the fitting out of thirty rooms with bedsteads, was settled.[3] Four years later the carpenter was instructed to return to the building and line the walls of the soldiers' rooms backing onto the inner curtain with deals in an effort to combat the effects of dampness, which the Board deemed to be prejudicial to the health of the garrison.[4] A survey of the barracks in 1752 by the Ordnance engineer Dugal Campbell, shows the building to have comprised five bays, with two storeys and a large attic (see Fig. 48 below).[5] The ground floor was liberally supplied with entrances, but access to the upper floors seems to have been concentrated on large stair turrets at either ends of the building. The Irish Barracks was among the earliest buildings purposely erected to accommodate soldiers and it needs to be compared with those designed by Sir Bernard de Gomme at Portsmouth and Plymouth[6] and also, as it seems, at Tilbury.[7] These were simple, rectangular, brick-built, blocks beneath M-shaped roofs. Each room was provided with a partitioned privy, stairs and back-to-back fireplace. Set against regular layouts, and better constructions, the Tower

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1. WO 47/19A, f. 70. WO 51/18, f. 98 for a delayed payment for the earth removal.
2. WO 47/19A, f. 167.
3. WO 48/9, p. 532; WO 51/12, ff. 81-2. For the plasterer's account, *ibid.*, f. 48 and the mason's, WO 51/17, f. 63.
4. WO 47/19B, f. 45.
5. The drawing (B.L., Kings Top. Collection XXIV.23.m) is accompanied by a report, also by Campbell, in which the block is described as 'an old Building Framed with Timber and weather-Boarded on the front. All the principal Timbers are much decayed the Roof is very defective & letts in water. The whole Building is out of level and stands at present by the upright posts which are put in to sustain it'.
6. B.L. King's MS. 45, f. 36; Barker (1993), note 4.
7. B.L. Add. MS. ff. 5, 7 & 9.

lodgings appear less sophisticated with only the provision of communal stairs being features that subsequently became commonplace in eighteenth-century barrack designs.[1]

The 1679 Report Advised of 'divers great Abuses & Encroachments' the Privy Council established a committee to examine the state and condition of the Tower on 1 November 1679.[2] The committee's findings, read before Council on 3 December 1679,[3] included a number of recommendations relating to the riverside defences. These included demolition of much of the Iron Gate on the edge of the moat near the south-east corner with the 'stone Wall on both sides' and the slighting of the causeway leading to the Develin Tower. The stone wall between the Iron Gate `and the staires upon the River' was recommended to be taken down to a height of 6ft and a new wall erected across the Wharf slightly farther to the west. A gun platform near the Develin Tower needed to be repaired with access along the river curtain improved and a brick wall constructed for the soldiers to stand upon. Elsewhere the parapets needed to be lowered and three sally ports punched through the inner curtain to provide access into the Mint. With regard to the accommodation of the garrison it was argued that new 'Barracks'[4] could be constructed for one hundred and fifty-six men and their officers in a garden 'in the possession of the Comptroller of the Mint' evidently located between the Broad Arrow and Constable towers in the Irish Mint. In addition a company of soldiers might be lodged in certain old houses close to the existing barracks nearby, half a company in the Bloody Tower and another in the 'Martin' [Middle] Tower, then in the possession of the Porter of the Mint. A new Corps de Guard was recommended to be built 'upon the Hill, but more towards the Church' than the old one close to the Beauchamp Tower, while another guard-house

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1. *Cf.* the block erected on the site of the Irish Barracks in 1752, Parnell (1993), Fig. 65, p. 85. The continued use of individual stairs, as favoured by de Gomme, was demonstrated in the 1689 barracks along the north side of outer court at Hampton Court Palace, an unusual structure, in so far as it was constructed by the Office of Works, Colvin, ed. (1976), p. 156, and a proposed barrack block for St Mary's Island, Isles of Scilly, by Christian Lilly in 1715, B.L. King's MS. 45, f. 12.

2. PC 2/68, p. 267.

3. *Ibid.*, pp. 300-2; PC 6/18, pp. 165-7.

4. This appears to be a very early use of the word 'barracks' in any account associated with the Tower, and perhaps for that matter in any British document, as its first appearance in the sense of a permanent lodging for troops is not recorded in the Oxford Dictionary until 1697.

on the Wharf close to the Byward Barbican needed to be repaired. The committee also complained about a certain Captain Sharpe who had enclosed some ground upon Tower Hill, towards the Postern Gate, and who was in the process of building a house there which they deemed prejudicial to the defence of the Tower.[1] Finally, it was argued that the number of gunners at the Tower should be reduced from one hundred to sixty. Better pay, together with lodgings provided within the fortress, it was argued, would enable more efficient gunners to be recruited to replace those already in post, most of whom the committee were informed were not gunners, but men of other trades.

The report of the committee was approved and implementation of some of the recommendations began almost immediately with a warrant being issued on 10 December for installing bedsteads in the Middle Tower and for 'fitting up the ould houses and stables in the Mint for the soldiers lodgeings'.[2] In February 1680 contracts were signed with the bricklayers, John Downes and Robert Fitch, for the work along the river defences.[3] Ramparts were enlarged, parapets reset and additional access stairs provided. Most of the ramparts were widened to a depth of 6ft,[4] but immediately west of the Develin Tower this was increased to 14ft, presumably to accommodate the small battery known to exist there by 1682. Cross walls were erected at either end of the new platforms to contain infills of earth and rubbish; in the case of the wider platform 'so that the same doe not fall into the greate arch where the 2 gunns are placed under Divells [Develin] Tower'. The same contract saw the demolition of the causeway leading from the Iron Gate to the Develin Tower so that 'the water of the Ditch may Runn round'. Presumably weakened by this operation, the Develin Tower was then thickened and buttressed down its east face with stone taken from the causeway.

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1. The issue generated a good deal of concern, WO 55/394, p. 53; WO 47/13, ff. 46 & 48; PC 6/18, pp. 168 & 197-8; PC 2/68, p. 326 and *ibid.*, p. 336 for the order to slight the building.

2. WO 51/22, ff. 57-9 & 123.

3. *Ibid.*, ff. 113-6.

4. It is possible that part of this work is reflected in the wide wall walk that now exists between the Byward Barbican and St Thomas's Tower, though externally the whole affair has a late nineteenth-century appearance.

In March 1680 contracts were signed with the bricklayers for taking down parts of the Develin Tower, the Iron Gate and the 'Walls on both sides to the gate upon Tower wharfe' and for building a new wall nearer to the Develin Tower 5ft thick and 10ft high with a great gate in it.[1] In April another contract was signed for rebuilding part of the old stone retaining wall to the outside of the moat between the Develin Tower and St Thomas's Tower, and for numerous smaller repairs and alterations to the river defences, including walling up the front and sides of the 'Old Sally porte' [i.e. Cradle Tower].[2] In May 1680 the Board ordered about 35 yards of the remaining old brick Bulwark near the Wharf to be removed after being informed that it was ready to fall[3] and during the following month an account was settled for clearing the moat between Traitors' Gate and the Iron Gate.[4]

The 1682 Report On 19 May 1681, in response to the threat of fire, the Privy Council established yet another committee of peers to examine the Tower[5] and in advance of a report ordered that no stables were to be maintained within the walls, except those belonging to the Constable and Lieutenant, and those associated with the Mint's Mill House.[6] Evidently these injunctions were ignored for on 2 December 1681 the Council ordered another committee, appointed during the previous August to view the condition of the Record Office, to examine the condition of the Tower and in particular to consider 'means of preventing the Danger of fire, it is exposed to be reason of severall Stables made use of by the officers and other persons'. The committee was likewise to report on 'what repaires and other works which are necessary to be done forthwith ... for the Safety and Conveniency thereof and the Garrison therein'.[7] The order for preparation was signed on 27 January 1682[8] and the report was read before Council on 8 February 1682. The minute states that 'his Majesty taking the said Report into consideration was pleased

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1. WO 51/22, ff. 100-1 & 168; PRO 30 37/9, f. 15 for imprest.
2. WO 51/22, ff. 163-7.
3. WO 47/9, f. 33.
4. WO 51/22, f. 145.
5. PC 2/69, p. 289.
6. *Ibid.*, p. 290.
7. *Ibid.*, p. 418.
8. *Ibid.*, p. 444; PC 6/18, p. 184.

to approve thereof, & did Order that it be, & it is hereby referred to the Right Honourable the Lords Commissioners of the Treasury to take care to provide money so soon as the state of his Majesty's affaires will permitt'.[1]

A transcript of the report entered in the Privy Council Register was published by Britton & Brayley in 1830.[2] It appeared without comment, save for identification (erroneously) of the so-called Lord Dartmouth bird's eye view and elevations as an accompaniment to the report (see **VI**, p. 160 & Fig, 55 below). Another copy of the report survives in the Ordnance records prefaced by a transcript of a royal warrant dated 13 July 1682 authorising implementation of a number of the recommendations.[3] This contains memoranda not found in the Privy Council copy together with some comments in the margin indicating whether work had been contracted for and other observations (see Appendix B, pp. 177-93 below). More important, however, is the use of an index which correlates with another undated plan of the Tower derived from the Dartmouth collection of drawings (the 1st Baron Dartmouth, formerly George Legge, being Master-General of the Ordnance between 1682 and 1689) now in the Royal Armouries at the Tower (see **IV**, pp. 158-9 & Fig. 49 below). There can be little doubt that the drawing and the copy of the report are contemporary and unlikely to date much later than the warrant of 13 July 1682. In fact the drawing had probably been prepared some months earlier during the drafting of the report. It is very detailed and provides the earliest topographical view of property disposition within the fortress. Many of the buildings referred to in the report can be identified together with the proposed batteries along the inner and outer defences (each gun represented by a dot). The scale of the report was considerable with all parts of the inner and outer defences embraced except the line between the Bell and Salt towers, which no longer served any military use. These proposals, together with other recommendations relating to the accommodation of the garrison, were presented as thirty-two articles which the committee estimated would cost £6697.02s.07d.

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1. PC 6/18, pp. 184-9; PC 2/69, pp. 450-4.
2. Britton & Brayley (1830), pp. 229-35.
3. WO 55/396, pp. 76-83. For the Master-General's subsequent warrant to Sir Christopher Musgrave dated 14 July 1682, WO 55/470, p. 111.

An almost immediate response was made to the recommendation concerning the complement of gunners and on 12 April 1682 warrants were issued to '60 fed Gunners', paid at the rate of 12d per day, to replace the previous one hundred retained at 6d per day.[1]

Work on many of the recommendations began with warrants and contracts being issued during the second half of 1682. Initially the outer defences enjoyed priority, but by the beginning of 1683 orders for the inner defences were being placed. Not until the end of 1684 was a start made on many of the projects within the walls and work was only completed by the beginning of 1688.

The retaining wall was continued around the east side of the moat[2] while the Board thoughtfully set aside just over £138 for 'making a Raile ... round the Tower ditch to prevent peoples falling in'.[3] Once again the masonry required a substantial foundation and a surviving contract for the work with the carpenter Thomas Moore dated 8 February 1683 refers to 18-20ft long piles being driven-in to the floor of the construction trench in order to reach solid ground (see Appendix C, pp. 195-6 below). The strengthening of the western entrance, with the provision of new gates leading into the outer enclosure and a spur palisade beyond 'Planked on both sides 5 foot 1 high' was undertaken during July and August 1683 after all the available carpenters at the Tower were commandeered to complete the task with all possible speed.[4] Nearby, 'towards Tower Street', a platform 40ft long and 17ft wide was ordered to be constructed 'upon the Top of the Leads of the Pike-house' to accommodate four pieces of ordnance.[5] Upon the Wharf, palisades were installed before the drawbridge at the Byward Barbican, St Thomas's Tower and the new cross wall towards St Katherine's.[6]

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1. WO 55/469.
2. Carpenter's order, WO 47/13, f. 25 and account, WO 51/27, f. 98; Bricklayer's order, WO 47/13, f. 21 and account, WO 51/27, f. 177.
3. WO 47/12, f. 34.
4. WO 47/13, ff. 128 & 130; WO 51/27, f. 148.
5. WO 47/13, f. 43.
6. WO 51/29, ff. 212 & 214; WO 51/30, ff. 83-4.

The twin towers of the Byward Tower were fitted with small gun platforms[1] while against the outer curtain wall some 90ft to the north a large platform 123ft long and 18ft wide was installed for twelve guns, much to the inconvenience of the Mint, who lost the top 7ft of their Melting House.[2] To the north, on the corner of the *enceinte*, Legge's Mount, 'formerly called the Old Tower', was much enlarged and altered to accommodate two batteries of guns - six pieces being located on the first floor and seven pieces on the roof platform;[3] the latter was reached by new stairs connecting with the ramparts to the south and east (see Fig. 50 below). The enlarged tower comprised three storeys, the third, only 5½ft high, having now disappeared, probably as a result of the introduction of the existing bomb vault in the late eighteenth or early nineteenth century.

Midway between Legge's Mount and Brass Mount the carpenter erected a large sentinel box over the angle of the wall. Described as 10ft long, 8ft 3ins wide and extending 6ft beyond the face of the wall on girders,[4] the device housed two small pieces of ordnance trained along the *enceinte* to the east and west. Some 80ft to the west a small 18ft square platform for two guns was installed[5] while at Brass Mount the medieval loops in the gallery were cut down to accommodate eleven minions and the parapet above rebuilt and a double foot bank for musketeers to the rear formed (see Fig. 51 below).[6]

Between Brass Mount and the Develin Tower, at a point to the south-east of the Broad Arrow Tower, a large gun platform 70ft long and 18ft wide was erected.[7] A smaller platform was constructed immediately north of the Develin Tower while in the Develin Tower itself a new floor was laid and gun ports provided.[8] Elsewhere along the line of the outer landward walls ramparts were cleared of impediments, parapets refurbished, foot banks and sentinel boxes installed and toilets provided for the convenience of the guard,[9]

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1. WO 47/13, f. 8; WO 51/27, ff. 116-7.
2. *Ibid.*, f. 20; *Cal. Treas. Books 1685-89*, p. 579.
3. WO 51/26, ff. 210-3; WO 51/27, f. 97.
4. WO 51/26, f. 211.
5. WO 51/27, f. 21.
6. WO 47/12, f. 59; WO 51/27, f. 57.
7. *Ibid.*, f. 21.
8. *Ibid.*, f. 97; WO 51/26, f. 211.
9. E.g. WO 51/26, f. 208; WO 51/27, f. 57.

the latter two being ordered to be painted three times in oil, the last colour blue.[1] Apart from the construction of a large gun platform over the leads of St Thomas's Tower,[2] with new gates being provided for the watergate below,[3] little work was undertaken along the river curtain for this, as has already been shown, had largely been attended to in 1679-80.

The alterations to the mural towers along the inner defences followed a regular pattern - existing battlements were raised in brick to a continuous level, a lead-covered timber platform was then installed, after which the wall was carried up another 4ft 6in to form a parapet with a foot bank to the rear. The order to begin work on the Bell, Beauchamp, 'Deverin' [Devereux], Flint, Bowyer and Brick towers was given on 18 January 1683,[4] the 'Jewell' [Martin] Tower on 20 January and the Constable, Broad Arrow and Salt towers on 8 February. Another platform was ordered to be planted on the south side of the Devereux Tower[5] over a building which on a Hollar engraving of 1641[6] and the Spilberg painting of *c.*1690 (see Fig. 52 below) can be identified as a large medieval chamber block. The device was intended to accommodate four pieces of ordnance and was evidently linked to the Devereux Tower by means of a bridge.[7] Recent investigations within the Devereux Tower have disclosed the remains of the gun platform installed here in 1683 (see p. 135 below) and partly detailed in a surviving draft contract with the bricklayers, John Downes and Robert Fitch dated 5 February 1683 (see Appendix C, pp. 194-5 below). Elsewhere communications between the towers were improved[8] and sally ports punched through the inner wall and into the Mint midway between the Devereux and Flint towers (see Fig. 53 below) and immediately west of the Martin Tower (see p. 135 below).[9]

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1. WO 47/12, f. 17.
2. WO 51/27, f. 20.
3. WO 51/30, f. 43.
4. WO 47/13, ff. 8-9, 10 & 25. The building accounts for these towers are found in WO 51/27, ff. 75-6, 93, 100-1 & 116-7.
5. WO 51/27, f. 93.
6. Hind (1922), Plate XXXI.
7. WO 51/27, f. 105.
8. WO 51/26, ff. 208-9.
9. WO 51/27, ff. 75-6; WO 51/37, ff. 211-3.

Regarding the accommodation of the garrison, new guard-houses were constructed within the enclosure at the western entrance[1] and on the Wharf 'near St Katherines',[2] the timberwork of the latter being painted blue.[3] In 1685-6 a two-storeyed, essentially brick-built, barrack block was constructed in the Irish Mint to replace an old one which the committee thought would not stand longer than two years (see Fig. 3 below).[4] This was ordered to be built in the garden of the Mint Comptroller north of the Broad Arrow Tower as recommended by the committee,[5] but surveys dating from the early years of the eighteenth century show nothing on the site. The 1682 plan does, however, mark soldiers' lodgings against the outer curtain wall to the south and immediately opposite the principal barrack block erected in 1669-70 (see Fig. 49 below) and it is probable that the new building occupied the same position. To the north, part of another soldiers' lodging against Brass Mount had to be pulled down to enable brass guns to be brought onto the tower, and then rebuilt.[6] At Legge's Mount part of the interior was equipped with beds, cupboards, tables and benches for two companies (sixty men) of Coldstream Guards who were quickly billeted there;[7] the remaining accommodation was occupied by twelve gunners.[8] Another company of guards and four officers were quartered in the converted apartment of an official in St Thomas's Tower[9] and another eight soldiers in the Cradle Tower to the east.[10] Nearby a coach-house and two stables belonging to the Ordnance Surveyor and Store Keeper were converted into lodgings for gunners as was part of the old Ordnance office behind the Chapel of St Peter ad Vincula.[11]

Within the Inner Ward the formation of a new parade ground to the north of the Lieutenant's lodgings began after orders to clear the site were given during September and

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1. WO 51/27, f. 130.
2. WO 51/30, ff. 84-7.
3. *Ibid.*, f. 115.
4. WO 51/36, ff. 4, 67-8 & 77.
5. WO 47/15, f. 88.
6. WO 47/12, f. 18.
7. WO 47/13, ff. 34 & 75.
8. WO 51/26, f. 120.
9. WO 47/13, ff. 124, 127, 136, 192 & 199; WO 51/27, ff. 198-9. *Cal. SP Dom. 1684-85*, p. 110 for compensation to Sir Thomas Stringer for the loss of his lodgings.
10. WO 47/13, f. 127; WO 51/27, f. 199.
11. WO 47/13, ff. 2, 13, 21 & 34; WO 51/27, f. 70.

October 1684.[1] By the end of November a Warder's guard-house had been taken down and re-erected elsewhere.[2] By March 1685 the bricklayers had pulled down the old main guard near the Beauchamp Tower and the walls around the nearby bowling green and garden and had rebuilt the retaining wall and stairs north of the Bloody Tower,[3] the existing wall arrangement represents a nineteenth-century reworking of the 1685 features. Towards the end of 1685 a new main guard had been constructed near the north-west corner of the White Tower (see Fig. 3 below), the parade ground paved and the nearby stables of the Lieutenant, immediately south of the Beauchamp Tower, converted into Warders' lodgings.[4] The new main guard was evidently a modest single-storeyed brick structure comprising a guards' room and an officers' room separated by a passage. During 1687 a prison was added to the rear of the building,[5] presumably a necessary accompaniment to the harsh orders governing the conduct of the garrison then operating at the Tower.[6] In 1688, following implementation of most of the recommendations set down in the 1682 report, the appearance of the Tower was recorded in a series of plans and prospects by the Ordnance Engineer, Holcroft Blood (see **VI** & **VII**, pp. 160-61 & Figs. 55 & 56 below).

Besides the recommendations set out in the 1682 report there were a few separate proposals which appeared at this time, but which for one reason or another never reached fruition. The most notable of these, drawn up by Sir Bernard de Gomme, was for a large fortification to prevent an assault on the Tower from the eastern end of the Wharf (see Fig. 54 below). The plan involved the excavation of a 40ft wide extension to the eastern arm of the moat through the Wharf and into the Thames. To the west was to be built a four-sided redoubt 35ft high comprising two floors. The upper platform was to contain eight embrasures for guns with the parapet pierced for musketry and equipped with three projecting brick sentinel boxes. Wing walls with returns along the north and

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1. WO 47/14, ff. 24, 31 & 41.
2. WO 51/29, f. 96.
3. WO 51/30, f. 4. For the archaeological evidence for this building see Parnell (1979), pp. 320-6.
4. WO 51/29, f. 213; WO 51/31, ff. 82, 84, 95, 103, 105-6 & 114.
5. WO 51/34, ff. 147 & 150.
6. Reid (1978), pp. 136-7.

south sides of the Wharf were to be constructed to protect the flanks with a 40ft 'Traverse Wall' apparently across the Wharf to the rear. The latter was intended to have a round tower built in Portland stone in the middle of it `as it is done at Portsmouth'. With the construction of a drawbridge over the moat and the equipping and furnishing of the redoubt de Gomme estimated the cost of works to be £4301.17s.10d.[1] A royal warrant authorising the Master-General to begin work was issued in July 1683,[2] but no further action appears to have been taken.

One additional measure that was implemented, was the planting of five mortars on the platforms at Legge's Mount, Brass Mount and the Develin Tower in 1685. The carpenter provided frames for the guns to rest upon and raised boarded sheds over them to keep out the weather.[3] More than anything else, mortars in these positions suggest a deliberate attempt to intimidate the City and it is significant that the warrants for installation were issued within days of the throne passing to James II following the death of Charles II on 6 February 1685.

The Late Stuart and Early Hanoverian Period Throughout the concluding Stuart era the defences of the Tower were subject to little more than occasional and, as it seems, inadequate, repair and maintenance. The recoinage of 1696 brought with it demands from the Mint for additional facilities and during January and March of that year the Ordnance ordered 'one of the lower Roomes and all the upper Roomes' in Legge's Mount together with the barrack block erected in the Irish Mint during the 1680s to be vacated and handed over to the officers of the Mint.[4]

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1. SP 29/429, no. 207i, pp. 711-8.
2. *Ibid.*, no. 207, p. 207.
3. WO 51/30, f. 43.
4. WO 47/18, ff. 105, 113 & 203. Evidently the Officers of the Mint were not so willing to return these buildings and in 1704, and again in 1715, the Ordnance was still trying to repossess some of the property, WO 47/28, f. 228; and WO 46/6, pp. 2 & 5 for the Mint's response.

In 1700 the main guard which had been constructed near the north-west corner of the White Tower only fourteen years earlier was demolished[1] after the Lords Justices decided that it impaired the 'Beauty and prospect' of the Grand Storehouse to the north.[2] Seventeen years later in March 1717 the Board approved an estimate for a new one to be constructed against the west side of the White Tower at a cost of £983.14s.06d.[3] Imprests of money to the carpenter, William Ogborne, and bricklayer, Henry Lidgebird, were authorised on 16 April[4] and by the end of September their bills were being settled.[5] The plan of the two-storeyed building measured some 95ft x 23ft (see Fig. 57 below). The principal west elevation was articulated into five bays with plain pilasters carried above the height of the first floor cornice and on to the parapet. The window openings had segmental arches and were fitted with sash frames. An open colonnade, comprising seven openings with semi-circular arches springing from plain imposts, occupied the ground floor. On either side the recessed and enclosed bays contained stairs to separate officers' and soldiers' accommodation on the first floor. The latter, together with the guard room on the ground floor, contained three large wooden slatted beds; a remarkable survey of the ground floor bed, some 40ft in length, still survives (see Fig. 58 below). It may be added that in architectural terms the building is significant in so far that it represents an early example of what became a standard design for guard-houses in the eighteenth century.[6]

At the very end of the Stuart period the state of the defences once again came to the fore. Many of the 1680s gun platforms were by now in a poor state of repair and a survey taken in June 1712 lists defects to many of those along the inner defences, most of whom were accompanied by guns with no carriages. By and large those along the outer walls were in a better condition, though the platform over St Thomas's Tower was found to be

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1. WO 51/61, f. 5.
2. WO 46/4, f. 35; *Cal. SP Dom. 1699-1700*, p. 262.
3. WO 47/30, f. 108.
4. *Ibid.*, f. 128.
5. WO 51/99, ff. 40-1; WO 51/100, p. 61. For the mason's bill settled in December, *ibid.*, p. 85.
6. A similar structure was proposed for Sherness in 1717-8, B.L. King's Top. Collection, XVII.19.1, while a new guard-house erected against the north side of the Middle Tower at the Tower of London in 1752 was almost identical, Parnell (1993), colour plate 10.

rotten with eight of its ten guns being unserviceable.[1] Subsequently, on 16 November 1714, the Master-General of the Ordnance, the Duke of Marlborough, ordered the defective staging to be taken down and replaced.[2] By the end of the month platforms had been removed from St Thomas's Tower and 'several parts of the inner line'[3] and in January 1715 the brickwork above the platform to the south of the Devereux Tower was ordered to be dismantled.[4] A drawn survey of the various mural towers and their gun platforms seems to have been carried out in advance of reductions (see **XIV-XXVIII**, pp. 163-5 below).

Amidst this activity, Michael Richards, the Surveyor-General of the Ordnance, submitted a report to the Board on 19 March 1715, in which he reconsidered the effectiveness of the batteries at the Tower. In a damning account he judged the greater part of them of 'no more than appearance the wall not having breadth for them and a reasonable parapet'. The roof of St Thomas's Tower was not vaulted and he could see no merit in 'makeing new platformes for Guns of so little use'. The Develin Tower was not capable of using guns and thus needed to be rebuilt and enlarged if used for that purpose. All the guns along the inner line were deemed entirely useless, their weight being far too great for the walls and a danger to the 'buildings which hang' on them.[5] It was subsequently estimated that the cost of making new platforms for all the inner towers, the Develin Tower and Byward Tower would amount to £1709. Repairs to parapets were estimated at £2164; eighty-one new guns and standing carriages were costed at a further £2141 and £340 for rebuilding the Develin Tower. Faced with an estimate of £6354 for replacing seemingly impotent defences, together with the substantial cost of their annual maintenance, the Board recommended to the Privy Council that the order to replace the platforms should be rescinded and that the number of guns planted on the outer defences be reduced from one hundred and eighteen to forty-five, a figure, it was observed, that 'most Strong Towns in Europe have constantly mounted either in Peace or Warr'.[6]

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1. B.L., Add MS. 38 843, f. 32.
2. WO 47/20A, f. 46.
3. WO 51/92, f. 93; WO 51/93, f. 53.
4. *Ibid.*, f. 81; WO 47/20A, f. 50.
5. B.L., Stowe MS. 477, f. 18.
6. WO 55/346, p. 170; WO 47/28, f. 165.

The order of Council confirming reductions was duly issued on 30 June 1715[1] and in July the Board authorised warrants to the Office bricklayer and mason to 'take down the Devils [Develin] Tower so low as to leave height for one Room over the Vault'.[2] The order to begin dismantling all but the recommended forty-five guns along the outer walls was eventually given on 13 March 1718[3] with one of the few remaining 1680s gun platforms on Legge's Mount being replaced or substantially repaired between July and September that year.[4]

1. PC 2/85, p. 242; WO 55/346, p. 169; WO 47/28, f. 180.
2. WO 47/20A, f. 119; for payments to mason, WO 51/94, ff. 111 & 113.
3. WO 47/31, p. 67.
4. *Ibid.*, p. 248; WO 51/102, ff. 71-2.

III. THE BUILDINGS OF THE ESTABLISHMENT

(i) STOREHOUSES

The Office of Ordnance was responsible for supplying the armed forces with a great variety of arms and equipment and the demand for these items was naturally reflected in the storage facilities at the Tower. It might be useful, therefore, to begin this section with a brief summary of the contemporary habiliments of war.

Ordnance included brass and iron guns together with a variety of carriages to mount them on. At one end of the scale were brass mortars and heavy artillery pieces, at the other the diminutive falconet. In between these extremes were demi-cannon, culverin, demi-culverin, saker, minion and falcon. Each piece was of a different size, each had a different range and each required different shot.[1] Towards the end of the seventeenth century many types of ordnance began to disappear as guns were classified by weight of shot discharged. Complete standardisation, however, was not achieved until the late eighteenth century when the Ordnance insisted that guns should be bored from the solid state rather than cast.[2] In order to fire these pieces gunners needed ladles for measuring powder, rammers for securing the charge, linstocks for holding match, priming wire to clear the vent of a gun, sponges for cleaning out the barrel and searchers for locating defects in the bore. Other accoutrements included hand-spikes, wedges, tackles, gyns, levers, gundrugs, slings and sheers for moving, mounting and dismounting guns from carriages.

The variety of firearms handled by the Ordnance during this period was almost as great as that of cannon. The matchlock musket, fired by a separate charge of match, was still being used, but increasing preference was given to the snaphance musket, which was operated by a piece of flint in the cock striking a steel hammer and giving a charge to the priming powder. In addition, blunderbusses, pistols, carbines and many other firearms were being issued.[3] Musketeers required numerous accessories from the Ordnance

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1. Hogg (1970), pp. 266-72; Blackmore (1976), contains an excellent catalogue and glossary relating to cannon, mortars, carriages and gunners' accessories.
2. Tomlinson (1976), p. 388.
3. Blackmore (1961).

stores: bandoliers for holding charges, though cartridges contained in a cartouche box became more commonplace as the seventeenth century wore on, powder horns, match, flint, ramrods for securing the charge and rests to support the weapons when they were being fired. Bayonets were introduced in the 1670s, but it might be noted that the early issues were plunged into the muzzle of the gun, thus precluding the weapon from being fired.[1]

The post-Restoration Ordnance system of firearms manufacture depended on a much scattered workforce. Barrels and locks were bought from private contractors and sent to the Tower for viewing and proving before being issued to the London gunmakers for rough stocking and setting up into finished weapons.[2] The Office gunsmiths and furbishers working in the Small Gun Office at the Tower, although eminently capable of producing guns, only did so when a pattern was needed for an outside contractor to copy.

In addition to maintaining large quantities of gunpowder and saltpetre, the Ordnance was responsible for other sorts of explosives such as primitive shells, grenades, fireworks and bombs. Large numbers of edged weapons were stored and after 1670 the Office assumed responsibility for armour too. As far as the armed forces were concerned, the demand for armour was restricted to half body-armours of back and breasts plates with 'pots' (helmets) for mounted troops or 'harquebusiers' as they were known.[3] On occasions, however, armours of a better kind were commissioned. In November 1688, for example, Richard Holden supplied harquebus armours for three eminent supporters of the King - Sir Henry Shere, Lieutenant General of H.H. Train of Artillery, the Earl of Ailsbury, and Colonel William Legge, son of the Master-General of the Ordnance.[4] Moreover, Thomas Cox made two harquebus armours for Charles II[5] and Richard Holden made two

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1. ffoulkes (1945), pp. 53-4; Blackmore (1961), pp. 31-2.
2. Blackmore (1991), pp. 111-2.
3. E.g. for seven hundred received between 1685 and 1687, see WO 51/31, ff. 51, 115 & 135; WO 51/32, f. 126; WO 51/33, f. 43; WO 51/35, ff. 2 & 138.
4. WO 51/37, f. 119.
5. WO 51/15, f. 114, bill dated 24 April 1673.

more for James II,[1] including the well-known gilt armour which can still be see at the Tower.[2]

Lastly, with the amalgamation with the Office of Tents and Toils in 1685 the Ordnance assumed sole responsibility for the storage of tents, waggons (including those associated with royal progresses) and their accompanying utensils. Beds, bedding, cordage, flags for garrisons and uniforms for the Ordnance establishment, even surgical supplies, were but some of the non-military stores also provided by the Ordnance.

During the reign of Charles II the provision of new storage facilities at the Tower was largely confined to the Coldharbour area south of the White Tower. There are continuing references to a storehouse in the Mint, during the first few years,[3] but after this time it disappears from view. A modest brick, basemented storehouse beneath a lead roof was erected at the west end of the Wharf in 1669-70.[4] This is perhaps the narrow building that can be seen alongside the inlet known as Tower Dock on the 1688 survey (see Fig. 55 below). The purpose for which it was intended is not clear, though by 1683 it may have functioned as the 'Pike-house' referred to at the western entrance (see p. 52 above). Elsewhere the Ordnance stores on the hill north of the White Tower were repaired and maintained[5] as were the facilities in the great keep itself. A contract for new weather vanes to be made and placed over the turrets of the White Tower was signed in January 1669. Part of the reason for replacement seems to have been the alterations carried out during the Commonwealth when gilt balls were used to replace crosses and the royal arms.[6] In their bill dated 7 June that year, the well known map maker/surveyor, instrument maker and mathematician, Ralph Greatorix[7] and his associate William

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1. WO 51/33, f. 137, bill dated 14 December 1686 and WO 51/34, f. 80, bill dated 4 May 1687.
2. Blackmore & Blair (1991).
3. WO 51/6, f. 39.
4. WO 51/11, ff. 7 & 44-5; WO 51/12, ff. 18 & 48; WO 48/9, p. 502.
5. With regard to the general appearance of the storehouse at this time it is worth noting that in September 1680 the plasterer, Thomas Aldridge, was paid £41 for rendering the walls with 656 yards of plaster which he lined out to imitate stonework, WO 51/23, f. 27.
6. Exwood & Lehmann, eds. (1993), p. 50.
7. See entry in Tooley (1979).

Partridge, were paid £200 for '4 ffanes and Crownes with a strong crosse of iron with the fower Letters E. W. N. S under each ffane with a convenient counter poize handlike holding a Ball and crosse'.[1] The vanes, crowns, balls, crosses and letters were all gilded; the remainder was painted in a 'faire lead colour'. While the scaffold for installation was in place the opportunity was taken to repair the lead work of the cupolas.[2]

Between January and April 1672 the carpenter was renewing the floors of the powder rooms within the White Tower.[3] In the wake of the redevelopment of the Coldharbour, long rows of sheds were erected in 1685-6 against the palisade on the east, west and south sides of the White Tower, and down the east side of Coldharbour, opposite the New Armouries Building (see Figs. 10 & 49 below). Constructed of timber, and resting on masonry bases, the sheds were evidently some 14ft broad and 9ft high.[4] Those on the south side of the White Tower were described as sheds for waggons, presuambly a storage requirement associated with the merger of the Office of Tents and Toils in 1685, while in May 1688, those to the east were ordered to be fitted out for the reception of small arms.[5] Further storage facilities for small arms were provided within the White Tower in 1698 when a new floor was laid in one of the rooms and one hundred and eight posts with twenty racks for muskets set up.[6]

In 1685 the great storehouse in Coldharbour, 'where the Mortarpeeces are placed' (i.e. the former medieval great hall), was repaired.[7] One of the floors, presumably the upper since supporting posts are referred to, was repaired, plastered walls and a ceiling made good and two new four-light windows inserted, one in the 'Stonewall of the Backside', to provide extra lighting.[8] The builders returned to strengthen the first floor again in 1720-1 with the scavelman clearing the ground for bases on which the carpenter

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1. WO 47/19A, f. 77; WO 51/10, f. 67. For settlement of work performed in addition to the contract, *ibid.*, f. 69.
2. WO 47/19A, f. 128.
3. WO 51/15, f. 8.
4. WO 51/32, ff. 24, 37, 100, 117, 167, 169-71.
5. WO 51/37, ff. 194 & 198.
6. WO 51/56, f. 51.
7. WO 47/15, f. 121; WO 47/16, f. 29.
8. WO 51/30, f. 138; WO 51/31, ff. 102 & 109.

positioned new posts.[1] Otherwise, however, very little seems to have been done to the old building, which by this time was called the Cordage Storehouse, a name the building retained until it was eventually demolished some sixty years later.[2]

The Grand Storehouse In January 1687 the Master-General of the Ordnance, Lord Dartmouth, was advised of the 'crazy condicon' of the old storehouses on the hill north of the White Tower, and with 'how little safety his Majesties stores were therein lodged'. After a year's deliberation a draft and estimate for a single new storehouse was prepared and on 1 March 1688 Dartmouth gave instructions for work to proceed.[3] The building was to be the largest structure ever built by the Ordnance at the Tower (see Figs. 2 & 10 below) and was, until the end of its life in 1841, known as the Grand Storehouse.

In advance of building work, a mass of stores and other material needed to be removed from the old buildings and housed elsewhere. Among the items were two displays of historic armour, known as the Line of Kings and the Spanish Armour. The former is discussed in detail elsewhere (see pp. 119-27 below), the latter consisted of various trophies said to have been captured from the Armada of 1588.[4] The Tower survey of 1682 shows the Spanish Armour to have been housed in a building immediately east of the old Ordnance office behind the Chapel of St Peter ad Vincula (see Fig. 49 below). In May 1688 the carpenter, Thomas Case, was paid just over £76 for 'fitting up a Roome in Cold harbour ... for placeing the Spanish Armoury' and the painter and glazier smaller sums for related work.[5] The new home was in fact the upper floor of the storehouse erected in 1670-1 against the curtain wall north of the Wakefield Tower (see pp. 35-6 above & Figs. 2 & 10 below). The disruption which all this caused is reflected in the quarterly payments of £17.10s.00d made between April 1688 and March 1693 to George Francklyn, Deputy Keeper of the Armoury, in 'Consideracon of his great loss sustained by not showing the Armoury'.[6]

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1. WO 51/108, f. 36; WO 51/110, f. 93.
2. Parnell (1985b), p. 43.
3. WO 55/474, p. 10.
4. Borg (1976), pp. 332-52.
5. WO 51/36, ff. 85-6 & 89.
6. *Ibid.*, f. 137; WO 51/47, f. 66.

The operation must also have affected the Chapel of St Peter ad Vincula, for an Ordnance bill dated 31 March 1691 records work on the building together with the lodgings of Dr Hawkins, the resident chaplain. Among the items is a payment for raising the roof of the chapel along the north front.[1] Under normal circumstances the fabric of the chapel and the chaplain's lodgings would have been the sole concern of the Office of Works. It might be supposed, therefore, that the Ordnance demolitions preceding the construction of the Grand Storehouse adversely affected these two buildings.

While the contents of the old storehouses were being transferred the Ordnance Board pressed ahead with arrangements for the construction of the new building. On 29 March 1688 a contract was signed with Thomas and John Fitch for the demolition of the old storehouses and the construction of the new one, while on 5 April Robert Barker was appointed overseer of works on a daily fee of five shillings.[2] Work must have commenced almost immediately since Barker began to draw his pay four days later and continued to do so until the end of 1691, when he was awarded a gratuity of £20 for his service at the 'storehouse being now finish'd'.[3]

The Grand Storehouse was a building of some architectural pretension (see below). The Wren Society, without any obvious reason, ascribes its design to Sir Christopher Wren,[4] while more recently Noel Blackiston has argued that it was more probably the work of Sir Thomas Fitch who, together with his younger brother John, was responsible for its construction.[5] Blackiston, however, makes no reference to the 'Draught and Estimate' which emerged from the deliberations of 1687, and which formed the basis of Dartmouth's decision to proceed with the project. On the available evidence, therefore, there is no reason to suppose that the design emanated from outside the Office. There are, however, strong indications that alterations were made to the building design during

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1. WO 51/43, f. 20.
2. WO 55/474, p. 72.
3. WO 51/36, f. 137; WO 51/44, f. 137.
4. *Wren Society, Vol. XVIII* (1941), Plate V.
5. Blackiston (1957).

construction, though it is unlikely that these can be attributed to Sir Thomas Fitch either, since his death in September 1688[1] preceded the amendments.

The principal account for building the Grand Storehouse is supplemented by a second bill for 'over worke not menconced in the Contract'.[2] The imposing frontispiece, the cupola and the fenestration to the roof storey, are among those items shown to be additional to the original draft.[3] Also mentioned is the cutting out of the cyphers of James II from the keystones of the lower windows - a reminder that the building campaign spanned the upheavals of November 1688. In fact the political changes that accompanied the Revolution may have provided the impetus to redefine the role of the Grand Storehouse. No longer was it to be regarded solely as a depository for the stores previously lodged on the site; instead the entire first floor was to be given over to a remarkable display of figures and designs, largely composed of small arms, known as the Small Armoury (see below). It is quite possible that the tableaux and the embellishment of the building architecturally, as represented in the over work, were conceived as part of a scheme to create a military showpiece at the Tower by the new Protestant administration. As time went by the Grand Storehouse became more and more a museum of Britain's military might, and the ground floor, which housed the train of artillery, was gradually given over to a display of guns and trophies taken from battlefields around the world.[4]

The final bills settled with the widow of Sir Thomas Fitch, and his brother John, amounted to £13,942.12s.03d. In addition to this, and the fees of the overseer, there were a number of bills not included in the main contract. These comprised a payment of £155 to John Young, mason, for 'Carving ... & setting upp the Kings Arms in the Pediment'[5] and £49.18s.00d to Robert Bird, coppersmith, for making and gilding the

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1. Colvin (1978), pp. 308-9.
2. WO 51/44, ff. 146-50.
3. For an undated estimate of £721.05s.00d for fitting out the roof storey, see WO 49/115. This includes the cost of boarding the floor, providing the pedimented dormer windows and loading doors with their accompanying cranes.
4. Blackmore (1976), pp. 19-21.
5. WO 51/45, f. 12.

'Copper faine, scrolles and flower pott' and 'Globe' positioned over the cupola.[1] John Haywood, carpenter, was paid £136.07s.11d for works associated with a staircase[2] and the supply of one hundred and eighty poles 'for the Harnesses' and another £20 for a pair of great oak entrance doors 10ft 4ins high and 8ft wide.[3] Other payments included £539.07s.00d to Edward Silvester and his brothers John and Thomas for ironwork, £42.04s.02d was paid to Henry Howell, painter, £159.10s.02d to John Johnson, glazier, and £20.15s.09d to John Wilkinson, paviour, for paving with ragstone the 'Hill' before the storehouse.[4] Finally, gratuities of £15 and £5 were awarded to Thomas Lowdell and Henry Durbin, carpenters, for injuries they sustained during construction work.[5]

According to Maitland, the completion of the Grand Storehouse was marked by a magnificent banquet on the first floor, in which King William and Queen Mary were waited on by the warranted workmen and labourers wearing white gloves and aprons, the badges of freemasonry.[6] Chronologically this would have occurred sometime early in 1692, though no further documentary evidence for the event has been found.[7]

The Grand Storehouse was nearly 360ft long, 60ft wide and comprised two storeys and attic (see Figs. 14-6 below). It was constructed of red brick with Portland stone dressings below a leaded roof and boldly projecting oak cornice. The principal (south) elevation was divided into twenty-four bays with the ground and first floors featuring spacious, round-headed windows with moulded architraves and decorated keystones (see Fig. 11 below). These large openings were presumably designed to allow maximum light into the storage areas, though it may be noted that their form is more commonly associated at this

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1. WO 51/44, f. 17.

2. Comprised of forty-nine steps with rail and balusters, this is almost certainly the stairs at the west end of the building. That this did not form part of the Fitchs' contact is interesting, and may be interpreted as further evidence for a change in the building design.

3. WO 51/41, f. 107; WO 51/46, f. 30.

4. WO 51/38, f. 36; WO 51/45, ff. 40 & 118; WO 51/46, f. 105; WO 51/48, f. 122.

5. WO 51/43, ff. 16 & 119.

6. Maitland (1756), Vol. I, p. 168.

7. Such an event might normally have been reported in the London newspapers. Narcissus Luttrell (1857), merely notes the King's intention to inspect the stores at the Tower on 13 February 1692.

date with the re-building of City churches following the Great Fire, or a number of public buildings such as the Customs House at King Lynn, Norfolk and the Town Hall at Abingdon, Oxfordshire.[1] The tall round-headed windows that Hugh May employed in the remodelling of Charles II's palace at Windsor Castle provide another notable exception.[2] These appear to have been intended to sympathise with the fabric of the medieval castle, but their exceptionally deep concave surrounds, together with the absence of keystones, set them apart from the examples at the Tower.

Between the principal windows of the Grand Storehouse a continuous plain string course marked the level of the first floor. The roof floor was lit by square, casemented, dormer windows carrying pediments; there were also two pedimented loading doors embellished with consoles. Apart from the most westerly bay, which contained a staircase, the three bays at either ends of the building projected forward, the corners being articulated with stone quoins. Both projections featured ground floor doorways with architraves and pediments. The three centre bays similarly broke forward to form the frontispiece. This was executed entirely in Portland stone, was heavily rusticated and incorporated two engaged Doric columns either side of the entrance doorway. A 'black marble Table', 6ft by 3ft, was set above the entrance; presumably this carried an inscription, though no reference to one has been found. The entablature over the entrance, with its metopes decorated with alternating Medusa heads and carcass frames,[3] supported a narrow first floor balcony with stone balustrade and rail (see Fig. 13 below). The doorway to this was surrounded by a shouldered architrave and flanked by a pair of large niches. The whole was crowned by a pediment containing John Young's great martial arms - the only element of the building now to be seen at the Tower (see Fig. 12 below).

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1. It might also be mentioned that this form appears in the ground floor openings of the Court House at Windsor, which Sir Thomas Fitch evidently designed in *c.*1687 and whose construction he supervised until his death, when the Corporation ordered that it should be completed under the direction of Sir Christopher Wren, Colvin (1978), p. 308.

2. Colvin, ed. (1976), p. 318.

3. An iron framework packed with incendiary materials and fired from a mortar, Blackmore (1976), pp. 196-7 & 222. It is worth noting that the figures on the Grand Storehouse represent very early depictions of these devices.

The octagonal cupola over the centre of the building was 13ft in diameter and 'fram'd with windows scrowles and pillasters with Corinthan Bases and Capitalls & Carved cantoliver cornice'. Access to the cupola was by way of a pair of 'Geometricall' stairs.

Finally, midway along the rear (north) elevation, was a large stair turret. This in fact contained two staircases; one provided access to the roof storey, the other, a much larger structure known as the Grand Staircase, was set aside for members of the royal family, or any of the nobility 'whose Curiosity may lead them to view the Armoury'.[1] There exists an undated eighteenth-century drawing showing the ground floor entrance to the Grand Staircase (see Fig. 18 below) and an elevational survey of the staircase itself by Lemprière dated 1722 (see Fig. 17 below).[2] On the 1722 drawing, immediately over the doorway leading into the Armoury, may be seen a large (7ft x 6ft) royal coat of arms carved by Nicholas Allcock with 'leather work and Cherubins=heads &ca'. In addition Allcock provided five targets to adorn the stairs. One carried a representation of Jupiter and an eagle with 'Ornaments of Clouds', another the head of Medusa; the other three were each decorated with a 'Figure & a Beast'.[3]

In terms of cost and appearance, the Grand Storehouse was the most prestigious single building erected by the late Stuart Ordnance Office anywhere in the country and it is unfortunate that, as with so many lesser projects, the surviving accounts do not shed more light on the design process. It was not until 1717 that the department authorised the construction of a storehouse on a similar scale, though it had erected one with a larger plan shortly before the Grand Storehouse. Both buildings occupied the same site alongside the Ordnance wharf at Chatham. The fact that the earlier building stood for barely thirty years partly helps to explain the lack of cartographic evidence for it. Work began after a contract was signed with John Rogers and Anthoney Creswell on 26 April 1687; the principal bill and another for over work, which together amounted to

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1. Maitland (1756), Vol. I, p. 167.
2. There is also a survey of the turret and stairs (WORKS 31/149) showing how part of the masonry was taken down and rebuilt in 1749 following structural failure.
3. WO 51/54, f. 133.

£3,994.08s.04d, were passed for payment in June 1689.[1] The brick building is described as a 'Double Storehouse', evidently meaning that is comprised two compartments beneath an M-shaped roof. The ground plan was enormous being some 700ft in length and apparently 36ft wide. The number of floors is not stated, but there must have been at least two, for an additional bill was settled with Rogers for two pairs of stairs in February 1690.[2] Reference is made to 'Middle and End Buildings' which are presumably the 'Pavilons' mentioned in 1717 when the storehouse was being demolished (see below). The only other notable feature referred to is a large octagonal cupula surmounted by a gilded ball. It is interesting to speculate whether the Chatham building, or its author, provided the inspiration for the pavilions and cupola of the Grand Storehouse.

On 22 February 1717 the first reference is made in the Board's minutes to the intention to build a new storehouse at Chatham.[3] At the end of the following month the order to demolish the earlier storehouse was given and in April imprests were authorised to the Lidgebird brothers and William Ogborne to allow the new work to begin.[4] Construction must have proceeded rapidly for on 22 November the Board was calling for the gable ends to be completed so that the building could be occupied as soon as possible.[5] It is clear from the final bills, however, that work continued throughout 1718 and as late as 1 January 1719 a warrant to paint interior cupboards, etc, was issued.[6]

Two designs for the 'great Storehouse' survive.[7] They depict buildings of similar size, though of quite different architectural appearance. The unexecuted draft is in a more traditional style which, with its tall central pavilion incorporating large round-headed windows, is reminiscent of the Grand Storehouse at the Tower. Also in common with the Grand Storehouse is a centrally placed stair turret against the rear elevation. The provision of two further internal staircases towards either ends of the building, however,

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1. WO 51/38, f. 121. For a separate painter's account, *ibid.*, f. 202.
2. WO 51/40, f. 41.
3. WO 47/30, p. 43.
4. *Ibid.*, pp. 83 & 106.
5. *Ibid.*, p. 306.
6. WO 47/32, p. 42.
7. B.L. King's Top. Collection, XVII 16 42 e & g.

contrasts with the one provided at the western extremity of the Tower store - an indication that its unimpeded interior was intended for more than unitarian uses. The second scheme, designed in the Vanburgh-Hawksmoor manner (see p. 149 below) appears to have been executed as envisaged, though scope for modification is indicated by a letter ordered to be sent to the overseer of works.[1] In a recent article Nigel Barker states that the designs represent two separate commissions executed in quick succession.[2] This appears to be a misreading of the documentary evidence and the view first put forward by Lawrence Whistler that the more impressive draft (i.e. that designed in the Vanburgh-Hawksmoor manner) was chosen in preference to the other, still stands.[3]

In addition to the resemblance found in the unexecuted Chatham design, the Laboratory at Woolwich may be cited as having architectural similarities with the Grand Storehouse. Work on the Laboratory began after Robert Fitch was contracted to raise the brickwork in November 1694.[4] All that now survives of this once large complex are the two partly mutilated storehouses that face each other across an open courtyard.[5] Two-storeyed, the buildings are of five bays with the centres projecting forward to form pavilions which display flat corniced doorways and pediments containing cartouches. Like the Grand Storehouse the brickwork is articulated with stone quoins and horizontal bands. The generous windows have flat arches, rather than round-headed ones, but like the Grand

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1. WO 47/30, p. 226, order of Board dated 16 August 1717 'to Lt Lewis, that Mr Lidgbird being at Chatham, it is left to him whether he'l Carry the Facia round the Building, or only in the Front, it being of no Great Consequence'.

2. Barker (1993), p. 211.

3. Whistler, (1952), p. 382. Barker seems to have assumed that an order of the Board dated 8 April 1718 for contracts to be drawn up for building a second storehouse (WO 47/31, pp. 94-5) relates to the Vanburgh-Hawksmoor styled structure and therefore any work carried out beforehand concerns the other design. However, there is nothing in the minutes or bills to indicate that the second scheme was pursued in the short term. In any event, the draft submitted by the Surveyor-General in April 1718 was for a building 252ft long and 20ft 9ins wide, estimated to cost £1,814.12s.11½d. As designed and built the Great Storehouse was 350ft long, while the bills for it (WO 51/100, p. 80; WO 51/101, f. 68; WO 51/102, ff. 69-70; 78, 81-3; 102) exceeded £5,000.

4. Hogg (1963), Vol. I, pp. 223-4.

5. Glass (1983), p. 22.

Storehouse the pitched roofs were once pierced with 'Lucerne' windows caped with pediments.[1]

The order for the master carpenter, Henry Haywood, to begin 'fitting up the middle Roome of the great Storehouse ... for an Armoury of small Guns' was given by the Board on 11 January 1696.[2] Haywood received a second warrant on 4 July 1696 and the bill for his work records him 'fixing the Armes &ca ... by Mr Haris's direcons'.[3] The name of John Harris of Eaton, the central figure in the project, seems to appear in only a few contemporary Ordnance documents associated with the project. The most important of these are found in the minutes of the Board dated 25 January 1696, where there is an instruction for him to arrange the arms,[4] and in a bill of April 1698, which records a payment of £482.10s.00d to Harris for work undertaken between 21 August 1695 and 12 April 1698 in fitting out the Small Armoury at the Tower, two guard chambers at St James's Palace and the Queen's Guard Chamber at Windsor Castle.[5] The third figure closely associated with the work was the Office master carver, Nicholas Allcock, who on 19 September 1696 was instructed to provide carved mouldings, figures and other items for Harris's compositions and to help decorate the room, many being painted in 'proper Colours' by the master painter Henry Howell.[6] For his work Allcock received payments totalling £611.02s.03d, while Haywood's bills amounted to well over £2,000.[7]

The records indicate that some alterations were made to the fabric of the Grand Storehouse early in the project, with the bricklayer being ordered on 28 January to 'cut downe the setting off in the middle Roome' (whatever that involved), and to take down

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1. A storehouse very reminiscent of these was designed for St Mary's in the Isles of Scilly by Christian Lilly in 1715, B.L. King's MS. 45, f. 14.
2. WO 47/17, f. 20; WO 47/18, f. 94. To facilitate the work Haywood was awarded an imprest of £400.
3. WO 51/54, f. 88.
4. WO 47/18, f. 121.
5. WO 51/57, f. 46.
6. WO 51/55, f. 160.
7. Allcock's bills are found in WO 51/54, ff. 93 & WO 51/55, ff. 132-3; Haywood's are in WO 51/54, ff. 47-8 & 88-9; WO 51/55, ff. 144-5 & 150.

brickwork for a doorway and to make another doorway into a window.[1] Instructions given to the stone mason a few days later indicate that the doorway gave access to a staircase,[2] possibly that located at the west end of the building (see Figs. 14 & 16 below). The bay containing the western stairs appears to interupt the regular plan of the storehouse, and at first glance it might be interpreted as an addition. However, there is nothing in the accounts to indicate that the brickwork was anything other than integral with the main body of the structure. In fact, given the constraints of the site, the stair bay was rather cleverly recessed behind the eastern limits of the Chapel of St Peter ad Vincula, so that to some extent it was hidden when viewed from the south (see Fig. 10 below).

Access to the Small Armoury, for the visiting public, was in fact via the staircase at the west end of the building. In one of the earliest published descriptions of the Armoury, Ned Ward notes that when he ascended this staircase in 1700 'at the Corner of every Lobby, and turning of the Stairs, stood a Wooden Grenadier as Sentinel, Painted in his Proper Colours, cut out with as much Exactness upon Board as the Picture of a Housewife with her Broom'.[3] On the north side of the uppermost landing was a small Viewing Room where the furbishers cleaned and repaired the arms (see Fig. 23 below).[4] This room and the landing were separated from the Armoury by a low screen wall which had three doorways in it and was decorated with raised and fielded panelling painted 'wainscott' colour in common with the rest of the panelling which covered the lower parts of the walls in the Armoury. The centre opening with its distinctive 'paire of Gates ... the upper Part Ramped with an Impost Moulding' was set within a large frontispiece. The east face of the screen and its surroundings was carefully drawn by Lewis Petit in 1718 (see Fig. 19 below). Most of the frontispiece, including the Ionic pilasters,

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1. WO 47/18, f. 128.
2. *Ibid.*, f. 142.
3. Ward (1704), p. 310. For a general discussion about the fashion in the seventeenth and eighteenth centuries for the curious *trompe l'oeil* cut-out figures now known as dummy boards, Graham (1989).
4. In June 1697 the Board awarded the senior furbisher at the Tower, Henry Cripps, a quarterly payment of £22.10s.00d over and above his normal salary, in consideration of the great increase in work brought about by the setting up of the new armoury, WO 50/2, f. 85.

decorative brackets and pediment, was the work of Haywood, though Allcock carved the spandrels with `ffolleig & flowrige with festoons of leaves' and decorated the pediment with the King's crown and cyphers, cherubs' heads, festoons of flowers, oak branches and laurels. Allcock evidently provided even more by way of enrichments for the reverse face, including four 4ft long scrolls, two bearing the King's supporters with festoons of fruit and flowers and ornaments, the other two featured eagles holding shields with the English and Scottish arms in them.

Visitors passed through a doorway at the southern end of the screen and were immediately confronted by the full array of Harris's exuberant tableaux, a sight, according to Maitland, 'no one ever beheld without Astonishment ... not to be matched perhaps in the World'.[1] The north and south walls were each adorned with eight pilasters composed of pikes 16ft long, with capitals of pistols set in the Corinthian order. Between them Harris arranged his most spectacular creations. On the north side these included moons and fans composed of bayonets set in carved scallop shells decorated with 'ornaments of pearl and Currell with drops of Shells at the Ends'. The 'Waves of the Seas' were reproduced in bayonets and brass blunderbusses with capitals of pistols over them. There was a representation of the rising sun, irradiated with rays of pistols, a pair of folding ceremonial gates and arch made out of halberds and horsemens' carbines 'hanging very artifically in Furbelows and Flounces'. Here also was found perhaps Harris's greatest creation, Medusa's Head 'commonly called the Witch of Endor', set within three regular ellipses of pistols. The centre of the device was of carved work, described in Allcock's account as a 'Target carved with Medusass head, snakes & Ornaments of foldage ... 4 foot long & 1 foot 1 inch broad'.

Many of the displays on the south wall corresponded with those on the north, but also included a target 3ft 6in x 1ft 3in decorated with the figure of Jupiter riding a 'fiery Chariot drawn by Eagles, as if in the Clouds, holding a Thunder-bolt in his left Hand, and

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1. Maitland (1739), Vol. I, p. 496; *ibid.*, (1756), Vol. I, pp. 167-8. The account in the second edition appears to be identical to that found in the first true guidebook of the Tower published by Newbury (1753), p. 36 *et seq.* The earliest detailed published account of the display is found in Hatton (1708), pp. 636-7.

over his Head a Rainbow'. Here also was a carving by Allcock of '2 Stars & Garters with Crowns & the English & Scotch Armes in them' which Harris further embellished with pistols and other items.

At the eastern extremity of the room stood the figure of a great organ, ten ranges high, its large pipes made out of brass blunderbusses, its smaller ones by upwards of two thousand pairs of pistols. The organ was flanked by a 'fiery serpent' and a 'seven-headed Monster'. For the former Allcock provided 'A Large Snakes head ... 2 foot 6 inch by 2 foot & 8 inch Imbost Carved with flames of fire great Fines & other ornaments' and a 'Snakes Tayl 6 foot 6 inch long, 15 inch broad & 5 inch Imbost, Carved with festoons of shells pearles and Gudring [gadrooning]'. The body was composed of pistols and appeared to wind round. The hydra was made of carved heads and wings artificially joined with links of pistols. Completing the display at the east end of the rooms, standing in the corners below semi-circles of pistols, were two suits of armour attributed to Henry V and Henry VI.[1]

In the centre of the room, embellishing the route from the Grand Staircase to the balcony, were four great columns some 22ft high. These were largely the work of Haywood who decorated them with 212ft of circular twisted elm moulding to which he applied nine hundred wooden pins to support pistols (see Fig. 22 below). Allcock provided Corinthian capitals, eight dragon faces and carved *in situ* the twisted mouldings with raking leaves, flowers and berries. To the underside of the ceiling, between the columns, he added a large pendant in the form of a falling star. More carvings were fitted either side of the doorways leading onto the Grand Staircase and balcony. To the former this took the form of two panels bearing representations of the sun[2] which the painter silvered and lacquered; above were pine spandrels decorated with 'wings of fame trumpetts oak branches and Lawrells with other Ornaments' and below lime spandrels carved with festoons of flowers, husks, berries and oak branches. The pattern was rehearsed either

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1. The armour attributed to Henry VI was delivered to the Keeper of Small Guns at the Tower for display on 26 February 1697, WO 55/1656.

2. According to Britton & Brayley (1830), p. 269, on the east side as rising, and on the west, as setting.

side of the doorway to the balcony, the spandrels here being lavishly decorated with 'ffestoons of shells flowers & ornaments of ffolleig & drapery'.

At the west end of the room Harris created two pyramids of pistols capped with carved wooden heads. These stood on eight 'Circular pieces of Ornament ... Carved with Crowns & sceptors' and were placed on wooden pedestals 5ft high.

Finally, located in the centre of the room was a series of large gun racks[1] interspersed with eight square pillars and eight circular columns composed of pikes and pistols capped with carved Corinthian capitals. Surveys dating from 1715 and 1718 indicate that the whole was arranged around sixteen massive chests (see Figs. 16, 21 & 23 below), which during the second half of the eighteenth century were said to contain twelve hundred pistols each.[2]

By any standard the Small Armoury was a remarkable affair. In general terms many of the displays can be seen as an extension of the tradition for decorating guard chambers. There is no evidence for such displays within the royal palaces when the Commonwealth inventories were compiled and it is possible that the practice was only introduced from the Continent after the Restoration, perhaps encouraged by the Royalists who had travelled in exile. Some of the earliest displays appear to have been found at Windsor Castle. John Evelyn in his diary for 28 August 1670 notes that:

> 'Prince Rupert Constable had begun to trim up the Keepe, or high round Tower, & handsomly adorn'd his hall, with a furniture of Armes, which was very singular; by so disposing the Pikes, Muskets, Pistols, Bandilers, holsters, Drumms, Back, brest and head-pieces as was very extraordinary: & thus those huge steepe stayres ascending to it, had the Walls invested with this martial furniture, all new & bright, & set with such study, as to represent, Pillars, Cornishes, Architraves,

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1. For a drawing of a late eighteenth-century gun rack in the Armoury, see WORKS 31/115.

2. Newbury (1753), pp. 36-7; Chamberlain (1771), p. 99; ffoulkes (1916), pp. 22-3.

> Freezes, by so disposing the bandalliers, holsters, & Drumms as to represent festoones, & that without any Confusion, Trophy-like'.[1]

In July 1672, the Ordnance Storekeeper at Windsor Castle, Edward Wise, received the first of a long series of regular payments for cleaning and oiling the arms and armour in the storehouse, armoury and Prince Rupert's Hall.[2] The bill is for a period beginning 14 December 1670. There are no records of payments associated with a display before this date and it might be supposed that the installation was supervised by Prince Rupert perhaps employing arms and armour delivered to Edward Wise from the Tower in May 1670.[3]

Prince Rupert, who was appointed Constable in 1668, was also associated with the decoration of the King's Guard Chamber in the Upper Ward. An Ordnance warrant issued on 21 August 1677 authorised thirty drums and three hundred and twenty pikes to be sent to the castle for presentation in the new chamber 'accordinge to his Highness prince Ruperts desire'.[4] Further arms were ordered to be sent in September 1679 to 'fill up his Majesties Guard Chamber', an account of which 'Mr Mays' had in March the previous year.[5] This would seem to indicate the involvement of Hugh May, the architect responsible for the reconstruction of Charles II's apartments at the time.[6] The arms issued included one hundred and ninety 'Cases' (pairs) of pistols, four hundred and ninety carbines with cartouche boxes, eighteen blunderbusses and thirty 'Leading staves' (ceremonial pikes) 12ft in length.

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1. de Beer (1955), Vol. 3, p. 560.

2. WO 51/14, f. 113. In a subsequent bill dated 31 January 1673 (WO 51/15, f. 51), the arms and armour in the hall listed as cleaned include eight hundred muskets, five hundred carbines, five hundred pairs of pistols, fifty blunderbusses, one hundred and thirty-six back plates and pots, twenty Spanish bore spears, twenty ranseurs and Spanish partizans, forty partizans, seventy-seven halberds and six hundred and eighty long pikes.

3. WO 51/12, f. 12, payment for carriage of muskets, back and breast plates and pots.

4. WO 55/391, f. 149. An earlier order dated 17 July to send ten drums to Windsor for display probably relates to the same operation, *ibid.*, f. 147.

5. *Ibid.*, f. 178.

6. Colvin, ed. (1976), pp. 316-28.

On 15 April 1681 a royal warrant was issued to the Ordnance to send such 'Rich Spanish Weapons' as the then Lieutenant-General, George Legge, and Hugh May judged appropriate for the ornamentation of the guard room and St George's Hall. The guard room in question was presumably the King's Guard Chamber since it was stated that all the existing arms on the walls of the chamber were to be taken down and brought back to the Tower.[1] It is tempting to link this operation with a set of surviving designs for the decoration of the walls of the King's Guard Chamber with arms and armour. Now in the Royal Armouries at the Tower, these were formerly part of the Dartmouth collection of Ordnance drawings. Though undated, they can be assumed to have found their way into the possession of George Legge, 1st Baron Dartmouth, before he lost the post of Master-General of the Ordnance in April 1689.[2]

The earliest Ordnance account found of Harris's decorative work with arms and armour concerns the fitting out, between August and October 1687, of James II's guard chamber at Whitehall. A bill for this work records that Harris made four journeys from Windsor to supervise the operation and that he stayed in temporary accommodation for a total of eight weeks.[3] Significantly he was paid for 'his owne time and Labour to draw the Figure and to place up the armes accordingly' which demonstrates his ability to draft designs on paper. This same skill is also mentioned some years later in 1699 in connection with his fitting out of the King's Guard Chamber at Hampton Court.[4]

Harris's earlier career is not easily detected. He may have been the John Harris recorded at work in Windsor Castle as a smith in 1680.[5] The eighteenth-century historian Joseph

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1. WO 47/9, f. 67. On 17 May and 28 July the Board ordered more armour to be sent to Windsor in accordance with the wishes of May and Legge, see WO 47/10, ff. 50 & 69.

2. R.A., Inv. No. I.73. Bevan (1985), incorrectly attributes the drawings to John Harris and his work in the guard chambers at Windsor and Hampton Court during the 1690s.

3. WO 51/35, ff. 62-3. For the orders to deliver the arms and armour to Harris, see WO 55/1656, entries dated 30 September and 12 November 1687.

4. WO 51/59, f. 68, 'To John Harris for 180 dayes in Drawing Designs and placeing the Armes'. For an accont of the decoration of the Hampton Court guard chamber see Parnell (1994).

5. WO 51/24, f. 66. For subsequent payments to Harris at Windsor in September 1683 and August 1685, WO 51/27, f. 206 and WO 51/30, f. 147.

Pote, who wrote a history of Windsor Castle, described Harris as a gunsmith by trade and a sometime master gunner of the castle.[1] Assuming Harris had been active in the castle before his work in the Whitehall guard chamber, it may be supposed that he saw some or all of the arms displays in the state apartments and the Round Tower. In fact, he may have been influenced more directly by another figure associated with the furnishing of the Windsor guard rooms, a certain John Grahame. Grahame occupied the post of Ordnance Storekeeper at the castle from September 1684 to June 1689[2] and was responsible for employing non-warranted craftsmen, like Harris, to assist with Ordnance business. Between September 1685 and July 1686, Grahame furnished the walls of the Queen's Guard Chamber in the Upper Ward with pistols, pikes and armour. Of particular interest in Grahame's account for this work is a reference to some carved woodwork described as '2 large Circles to carry Pistolls over the suites of armour' and a painted oval target in which pistols were set.[3] Similar components were extensively employed by Harris, beginning in the Whitehall guard chamber[4] though the ravages of time have resulted in only five examples by Grinling Gibbons surviving in the King's Guard Chamber at Hampton Court.[5] There can be little doubt that Grahame's work and the earlier displays at Windsor greatly influenced Harris, though at the Tower the liberal use of carved work and the creation of free-standing devices, such as the seven-headed monster, testify to his originality and ingenuity. Details of Harris's later work in the royal palaces during the

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1. Pote (1749), p. 423.
2. Tomlinson (1979), p. 234.
3. WO 51/33, f. 5.
4. WO 51/35, f. 63. Of the three targets mentioned, two are listed as large, one being described as 'wherein is Guilded & painted the most noble order of the Garter' the other having a 'boarder of Gold shaddowed and Trophies of warr painted'. The third was 'Japand in the middle Argent a Cross Gules a Boarder very broad or shaddowed &c'.
5. Although the Ordnance was responsible for embellishing the chamber with arms, the Office of Works paid for the carving of the targets, WORKS 5/50, estimate dated 15 December 1699.

reign of William III have been identified,[1] but as with the Tower, there is no indication that any individuals, other than the supervised craftsmen, assisted him.

On 17 July 1697 Harris was appointed furbisher of the two guard chambers he had recently fitted out at St James's Palace with an annual salary of £30[2] and on 30 November 1699 he obtained the more prestigious post of Furbisher of the Armoury at Hampton Court.[3] In 1705 he undertook what, so far as the Ordnance accounts are concerned, may have been his last small arms display, the decoration of a room intended for Board meetings in the house of Thomas Earl, the Lieutenant-General of the Ordnance, in Pall Mall.[4] Once again Nicholas Allcock was called upon to provide a number of rich carvings including two capitals in the Corinthian order, the Lieutenant-General's coat of arms and a target with 'amhant & Modsin throphey togeather with ornaments of oak & laurell Branches'.[5]

By 1713 Harris had assumed the post of Master Gunner at Windsor Castle.[6] Still occupying his Windsor office, and by now an elderly man, he was awarded a gratuity, by order of the Master-General of the Ordnance, of £10 *per annum* on 3 February 1732 'in

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1. Apart from the fitting out of the two guard chambers at St James's Palace for the Prince and Princes of Denmark and the Queen's Guard Chamber at Windsor Castle, payment for which was included in Harris's account for work at the Tower (see p. 73 above), the Ordnance bills reveal payments in February 1696 for decorating the King's Guard Chamber at Windsor Castle (WO 51/51, f. 62), November 1699 for fitting up the King's Guard Chamber at Hampton Court (WO 51/59, f. 68) and January 1702 for the Old Guard Chamber [i.e. Prince Rupert's Hall] and Great Stairs in the Round Tower at Windsor Castle (WO 51/64, f. 72). Some of these displays are recorded in the water-colours prepared by Charles Wild and James Stephanoff for publication by Pyne (1819).

2. WO 50/3, f. 4.

3. *Ibid.*, f. 67.

4. WO 47/22, pp. 268 & 346, for the Board's orders dated 24 July and 13 September. Also WO 47/23, p. 65, for the Board's instruction to pay Harris dated 5 January 1706. There is evidence that Harris had previously arranged a display of arms in the lodgings of Lord Romney, Master-General of the Ordnance, at the Tower, see WO 51/45, f. 26, payment to Thomas Hawgood for delivery of swords and bayonets dated 20 March 1696 and WO 55/1656 for another of armour dated 17 April 1697.

5. WO 51/82, f. 6. WO 47/22, p. 268, for the Board's warrant to Allcock dated 24 July 1705 and authorisation to deliver pikes and other arms as specified by Harris.

6. WO 51/91, f. 14.

Consideracon not only of his long and faithfull but extraordinary service'.[1] He died, aged 79, on 8 August 1734 and was buried beneath the pavement on the south side of St George's Chapel, Windsor Castle, in the same grave as his wife Elizabeth, who had passed away five years earlier.[2] At the time of his death Harris still occupied the office of Master Gunner at Windsor Castle.

Finally, in attempting to understand the philosophy behind the composition of the Small Armoury at the Tower it might be suggested that the free-standing and engaged columns provided an architectural framework for the various fanciful displays, with the four great columns forming a central crossing. Perhaps the aisled plan mirrored that of a church - a distinct possibility when the presence of the great organ at the east end of the room is taken into account. By comparison, no coherent theme seems to have pervaded the other designs and figures, representing as they did such diverse subjects as the mythological Medusa and the backbones of a whale. Ned Ward during his visit of 1700 records how his official guide referred to the organ as 'an Allegorical Emblem of a Wolf in Sheeps Clothing'. This intriguing anecdote clearly amused Ward who contemplated

> 'Engines of Wars, whose harsh and threatening Sounds Proclaim nothing but Wounds, Death, Discord, and Desolation; to have such Mishievous Implements Disguis'd under the Form and Figure of a Musical Intrument, which Breaths forth nothing but Peace, Innocence, and Delight, and Harmony, is putting the Devil into a Canonical Robe'.[3]

It is, of course, possible that such an interpretation is little more than a guide's fanciful tale which on this particular occasion found a receptive ear. No illustration of the organ has so far come to light. In fact with the exception of an early nineteenth-century engraving showing the four large, baroque inspired, columns in the centre of the hall (see Fig. 22 below), no views of the tableaux have so far come to light. This might suggest that the practice was discouraged by the Ordnance itself. Whatever the reason, the loss

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1. WO 51/135, p. 94.
2. Bond (1958), pp. 91-2; Pote (1749), p. 403.
3. Ward (1704), p. 311.

of this fabulous collection in 1841 must be counted as one of the greatest single tragedies to have beset the Tower.

Even before the end of the seventeenth century a significant alteration to the structure of the Grand Storehouse was carried out, when in 1698-9 the trusses supporting the floor of the Small Armoury were strengthened.[1] Work involved the introduction of twenty timber columns, seated on Portland stone pedestals, and the repositioning and strengthening of the existing twenty pillars to form the aisles that can be seen on surveys of the building dating from the early eighteenth century (see Figs. 14 & 20 below). When finished all the columns and their capitals were painted to imitate white marble.[2] Further small scale works were carried out between 1713 and 1717, beginning with the introduction of iron railings along the south side of the building. In his bill dated 29 October 1714, a certain Richard Jones was paid £176.15s.02d for two hundred and fifty balusters and two hundred and forty-six spikes which, together with associated rails, props and wicket gates, were erected on a Portland stone base either side of the main entrance and painted lead colour.[3] On 18 October 1715 the Board ordered the clock made by Thomas Tompion for the turret over the Wardrobe Tower in 1674 (see p. 91 below) to be taken down, refurbished, and placed in the cupola over the Grand Storehouse. During the operation the clock faces were painted blue and gilded while the cupola itself was decorated white.[4] Subsequently, in December 1717, a bill was settled for erecting partition walls in the attic storey of the storehouse which then, as throughout the rest of its existence, functioned as a 'Ragg Loft' or tent store.[5]

More substantial works were carried out within the building in 1718-9. In November 1717 the Board contracted the master paviour, John Mist, to replace the timber boarding of the ground floor with Purbeck marble.[6] It was probably during preparatory work that

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1. WO 51/59, ff. 132 & 150.
2. *Ibid.*, f. 149.
3. WO 51/91, f. 84; WO 51/92, ff. 80 & 87.
4. WO 51/96, ff. 70 & 107.
5. WO 51/100, p. 39.
6. WO 47/30, f. 222. The bill for the work, which amounted to over £500, is found in WO 51/102, f. 113.

defects to some of the columns supporting the floor overhead came to light and on 1 April 1718 the Surveyor-General advised the Board of timber decay and evidence for settlement to the masonry bases on which the pillars stood. In addition, many of the ceiling trusses were found to be rotten where the ends were seated in the walls.[1] In view of the danger that these defects posed to the Small Armoury, warrants for repairs were issued immediately and by the end of 1718 remedial works were largely in hand. This involved twenty Portland stone corbels being let into the walls to support the joist and eight new timber columns with stone bases being installed on brick foundations. Some intriguing works were also carried out around the margins of the great room to accommodate gunners' accessories, including the ladles, rammers, sponges, linstocks, handspikes, picks, searchers and quoins, that accompanied the train of artillery. Three surviving Ordnance sketches indicate something of what was being considered, with a sequence of large blind arches in the north wall in which accoutrements are seen to be carefully arranged (see **LIII-LV**, pp. 171-2 & Figs. 24 & 25 below). It is not clear whether the arches, which look as though they were intended to imitate rusticated stonework, were actually formed, but the accounts do describe the carpenter putting up stays for ladles and sponges, making small ornamental arches and 'sweps' to set quoins in and twenty-nine semi-circles of elm to support quoins and handspikes.[2] In addition he made 'Chequer work' for the west wall while the smith provided bolts, hold fasts and other fittings for the 'Figures in the Artillery Room' some, or all, of which were located on the south side of the room.[3] It would seem that Colonel Albert Borgard was involved in the operation, for on 17 October 1718 the Board ordered that an account of what ladles, sponges, etc, needed to complete the arrangement along the north side of the room should be referred to him in order that outstanding warrants could be issued.[4] Whatever the final arrangement, it is clear that the train of artillery was beginning to be displayed in an ornamental manner and thus by 1719 the process whereby the Artillery Room became a major visitor attraction, rather than just a working part of the arsenal, may be seen to be under way. Indeed, there is evidence that moves in this direction had taken place some years before with objects of

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1. WO 47/31, p. 84.
2. WO 51/104, f. 109; WO 51/105, f. 60; WO 51/110, f. 105.
3. WO 51/107, f. 16; WO 51/111, f. 60.
4. WO 47/31, p. 303.

historical cariosity being displayed in the room. In 1710 a German visitor, Zacharias Conrad von Uffenbach, noted that wooden cannon deployed by Henry VIII at the siege of Boulogne were on show,[1] while two years earlier Hatton also saw a brass gun made for James I's eldest son, Prince Henry, and, perhaps most intriguingly, 'a Rack to extort Confession'.[2] This most infamous of Tower objects, so beloved by historical novelists, has come to represent what the late Professor R. A. Brown denounced as the 'morbid myth of a grim fortress-prison'.[3] It was, in fact, rarely used and possibly for the last time in January 1673 when the Lieutenant of the Tower was commanded by Secretary of State Arlington, to prepare it for the examination of certain prisoners.[4] By June 1675, however, it must surely have been de-commissioned for in that month 'the Rack of Torment' made the first of several appearances in Ordnance inventories.[5] How long it was displayed in the Grand Storehouse is not clear, but by *c.*1785 its remains were seen in an unidentified storeroom elsewhere in the Tower.[6]

In conjunction with the works in the Artillery Room the master carpenter was authorised to carry out repairs to the floor, racks and figures, etc, of the Small Armoury above.[7] The full extent of these adjustments is not clear, the bill for the work merely refers to 'altering the figures of arms' and applying 'Astragalls' (small semi-circular mouldings) to the capitals and bases of some of the columns.[8]

The last works to the building recorded in the period presently under discussion concern the laying of new Purbeck marble at the foot of the Great Staircase in 1720,[9] presumably the decorative surface which can be seen at the entrance to the staircase on an undated

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1. Quarrell & More, eds. (1934), pp. 39-40,
2. Hatton (1708), p. 636.
3. Brown & Curnow (1984), p. 36.
4. Heath (1982), p. 235.
5. R. A. MS.I.i. ff. 811-2. It might be worth noting that it was valued at 20 shillings - presumably the estimated cost of a replacement.
6. By Issac Reed who was allowed into a locked storeroom where he sketched 'part of this horrid engine' for a footnote to his edition of Shakespeare's plays, Reed (1785), pp. 35-6.
7. WO 47/31, p. 119, order of the Board dated 29 April 1718.
8. WO 51/103, f. 90; WO 51/104, f. 109.
9. WO 51/107, f. 32, per order of the Board dated 3 May 1720.

eighteenth-century drawing (see Fig. 18 below) and the caulking of the Small Armoury floor nearly two years later.[1]

Attached to the north side of the Grand Storehouse and bounded by the inner curtain wall to the north, the Grand Staircase to the east and the Flint Tower to the west, was a single-storeyed storehouse known as the Iron Vault (see Fig. 2 below). This housed the supply of pig iron (hence its name) for the Ordnance smith working in the Mint immediately to the north, though access into the building was evidently via the ground floor of the Grand Storehouse. The Iron Vault is first shown on a survey of the Grand Storehouse and environs dating from 1718 (see Fig. 20 below) though its origins are earlier. As the structure utilised the north wall of the Grand Storehouse it must have been built during or after the construction of the storehouse which began in March 1688 (see p. 65 above). It was certainly in existence by 1714 when a flat timber roof over the building was repaired.[2] In 1720-1, the roof was renewed, part of the replacement structure comprising an arch of brick construction.[3] Once again, however, the roof was made flat and in June 1722 the mason was paid for surfacing it with Purbeck marble.[4]

The Stores in and around the White Tower During 1715-6 considerable effort was made to improve the storage facilities in and about the White Tower. This began in February 1715 when, in order to provide accommodation for saltpetre purchased from the East India Company, the Board ordered the floor of the western basement to be laid with joists and boards and the walls to be lined with deals.[5] In April the floor of the adjacent room to the east was ordered to be lowered,[6] presumably for the same purpose, since later drawings indicate that saltpetre was stored here as well.[7] It would appear that these facilities were intended to replace the existing saltpetre vaults beneath the old Ordnance

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1. WO 51/111, f. 9.
2. WO 51/92, f. 9.
3. WO 51/109, ff. 87, 90 & 97; WO 51/111, f. 31.
4. WO 51/109, f. 106.
5. WO 47/20A, f. 68; WO 51/94, f. 32.
6. WO 47/20A, f. 91; WO 51/93, f. 54; WO 51/94, f. 8.
7. *Cf.* WORKS 31/95.

administrative office, which were vacated when the main body of the building was demolished between April and June 1715 (see p. 109 below).

In a move that was to bring about a significant change in the appearance of the great tower, the Surveyor-General, Brigadier Michael Richards, was instructed on 8 March to 'consider and give directions for makeing what Lights may be necessary to the Rooms in the White Tower in Order to render them usefull for lodging of Stores &c'.[1] Acting on his recommendations, the Office mason, Robert Churchill, was engaged between June 1715 and September 1717 in enlarging the window openings of the ground and uppermost floors to which he fitted the existing Portland surrounds.[2] The carpenter, William Ogborne, provided window frames and shutters, as well as four pairs of double doors for the loading bays and entrances in the north front (see Fig. 5 below).[3] Churchill was also engaged in repairing with Portland stone the quoins of the roof embrasures and buttresses on the west front, as well as repointing and gallotting the ragstone of the elevations in general.[4]

Within the White Tower a new floor was laid in the Scotch Storehouse, which occupied the north-east corner of the first floor (see **LXIII**, p. 174 below), while considerable repairs and alterations were carried out in the stone building annexed to the east front, after the old proof house in the courtyard there was ordered to be pulled down in February 1715.[5] The roof of the annex was repaired and sash windows introduced while the first floor was fitted out as a Drawing Room and Record Office, and the ground floor converted into a Small Gun Office and Modelling Room (see pp. 92-7 below).[6] By February 1716 work was sufficiently well advanced to allow small arms to be transferred into the building from the old reception sheds to the east.[7] The sheds, erected in 1685-6

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1. WO 47/20A, f. 78.
2. WO 51/94, ff. 23, 111 & 113; WO 51/97, f. 35.
3. WO 51/99, ff. 20-1.
4. WO 51/96, f. 72; WO 51/97, ff. 20-1 & 35; WO 51/99, f. 15; WO 51/100, p. 8.
5. WO 47/28, f. 107.
6. WO 47/20A, ff. 96, 99 & 119; WO 51/95, f. 26; WO 51/97, f. 13; WO 51/99, ff. 20-1.
7. WO 47/29, f. 98.

(see p. 64 above), were deemed beyond repair by the Board which therefore ordered them to be pulled down. Their removal formed part of a general clearance around the White Tower, which included the contemporary sheds to the south and west, as well as those down the east side of Coldharbour, together with the wall and palisade raised about the great tower and its eastern annex during the reign of Charles II.[1]

In the wake of these demolitions the Board, on 25 January 1717, considered an estimate for constructing a 'Carriage Storehouse' on the south side of the White Tower. The estimated cost of the building (evidently intended to house gun carriages rather than wagons) was £847.17s.03d, and arrangements for its construction were placed immediately in hand.[2] By the end of March paving which lay before the old sheds had been lifted and the foundations for the new building had been excavated.[3] Construction work was evidently finished by the end of September 1717 when the bills with the carpenter and bricklayers were settled.[4] A contemporary draft of the storehouse shows the building to have been some 153ft long and 27ft wide (see Fig. 26 below). It was a simple brick-built structure, with the principal, south, elevation divided into eleven bays. The centre bay projected slightly forward and contained a pair of great doors flanked by flat pilasters supporting a pediment. Either side were three round-headed windows which alternated with blind openings carrying flat arches. Paired flat pilasters at either end of the elevation completed the composition. At either end of the building additional doorways were provided. Like the south entrance, these were fitted with a pair of stable doors divided horizontally to allow independent access to the ground and mezzanine floors within. Detailed drawings of the doors dating from 1717 and 1718 survive (see **XLVII & XLVIII**, p. 170 & Fig. 27 below). A draft for a carriage storehouse at Portsmouth, undated, but probably *c.*1718 and therefore a near contemporary of the Tower example, exist.[5] This shows a fine two-storeyed building designed in the Vanburgh-Hawksmoor

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1. WO 51/97, f. 13.
2. WO 47/30, f. 90.
3. WO 51/98, f. 124.
4. WO 51/99, f. 40; WO 51/100, p. 61. For excavating the foundations, see WO 51/98, f. 124.
5. B.L. King's Top. Collection, XIV.42.s.

tradition, far superior to the Tower building, but nevertheless with double stable doors at either ends to allow similar access.

(ii) OFFICES

The principal administrative office of the late Stuart Ordnance was located at the Tower where, according to instructions issued in 1683, senior officers were expected to meet at least every Tuesday and Thursday at about 8.00am in order to 'Consult together, and Order all Businesess appertaining to them'.[1] Though the office was to be maintained at the Tower until the nineteenth century, the Board ceased to meet there on a regular basis from as early as 1705 when a room was fitted out at the house of Thomas Earl, Lieutenant-General of the Ordnance, in the Mall (see p. 81 above). Subsequently, in 1711, an office was fitted out in Downing St,[2] which three years later was evidently replaced by facilities rented in Old Palace Yard, Westminster.[3]

The removal in 1673 of the Ordnance office from behind the Chapel of St Peter, to a more commodious site in Coldharbour, has already been described (see pp. 37-9 above). The building was extended in 1679 when an extra room, possibly that subsequently referred to as the Board Room, was added,[4] but otherwise no significant alterations to the structure were made until 1717 when a new wing was added (see pp. 90-91 below).

In February 1681, the Board ordered their upholsterer to supply furniture and furnishings for a room in the office called the Withdrawing Room[5] and later in the month John Young was duly paid £17.10s.00d for 62 yards of fine, double mixed, camblet hangings, a large folding oval table, six chairs and a large quilt leather screen.[6] In November 1682 it was also ordered that the room assigned to the Master-General should be provided with

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1. R.A., AL3; WO 55/536. The Board, however, did sometimes meet in the Master-General's lodgings, *cf.* WO 47/9, f. 99, instruction to the Board on 25 October 1680 to gather next at Sir Thomas Chichely's house.
2. WO 51/85, f. 60; WO 51/86, f. 13.
3. WO 47/20A, f. 46. Additional rooms at the Westminster building were rented in February 1715, *ibid.*, f. 76.
4. WO 51/21, f. 120.
5. WO 47/10, f. 33.
6. WO 51/23, f. 101.

new furniture and that the same should remain there during the winter months, presumably indicating that the room had not previously been occupied throughout the year.[1] Consequently, during December 1682, Young received a further payment for supplying six normal and one large 'Turkeywork' chairs, a large folding table and a fringed green cloth carpet to cover it.[2] Four years later he provided hangings for a room attached to the office with 42 yards of crimson paragon with a crimson silk and worsted tufted fringe.[3]

Further alterations and refurbishments were carried out during the closing years of the seventeenth century. Following the issuing of a warrant in September 1696 the upholsterer provided furniture and furnishings for the 'Office Roome', presumably the Board Room, to the value of £150.09s.00d.[4] This included the replacement of old wall hangings with two pieces of fine tapestry valued at £54. New green damask curtains with fringes and tassels were made for the windows while existing chairs were repolished and reupholstered. During the following year a carved screen covered in crimson damask was supplied for the Board Room[5] and in March 1699 the carpenter was paid for repairs and alterations in the Great Room and the 'Old Board Roome', evidently a reference to the 'Anteroome' which in 1673 was described as adjoining the Great Room (see p. 38 above). In the Great Room he installed 68 yards of new bolection-moulded wainscotting and adjusted other panelling already there. The sash windows were repaired and a new writing desk provided. Similar alterations were made to the panelling and sash windows in the old Board Room, with six new desks and two chests also being provided.[6]

Following an unsuccessful attempt to acquire the Constable's lodgings in and about the Lanthorn Tower (see p. 99 below) proposals to enlarge the office with an east wing were

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1. WO 47/12, f. 38.
2. WO 51/26, f. 143.
3. WO 51/33, f. 127.
4. WO 51/55, ff. 69-70.
5. WO 51/57, f. 111.
6. WO 51/58, f. 59.

laid before the Board on 6 March 1716.[1] The cost of the new range, which was intended to accommodate clerks, was estimated at £444.05s.04d. It was constructed in 1717-8[2] on a site to the west of the New Armouries Building which, until 1715, had been occupied by a row of Ordnance storage sheds (see Fig. 2 below). A contemporary drawing indicates that the range was designed as a two-storeyed structure, some 70ft long and 16ft wide. Divided into six bays with round-headed window openings and doorways, the facades were only sparsely adorned with a bold string course and plain pilasters (see Fig. 28 below).

Perhaps as an amenity to the new office in Coldharbour, a clock turret was constructed in 1673-4 on top of the Wardrobe Tower at the south-east corner of the White Tower powder house. The structure was faced with free-stone ashlar, was battlemented and carried a moulded string course of Portland stone.[3] It housed an extraordinary clock supplied by Thomas Tompion for £45 and was furnished with two sun dials and two 'block Dyalls'.[4] The dials were painted and gilded by the Ordnance painter, who also gilded a ball,[5] presumably that which can be seen to surmount the cupola on late seventeenth and early eighteenth-century illustrations (see Figs. 9, 55 & 56 below). The turret was taken down in 1715 after the Board was advised that it was too narrow to carry the weight of the cupola and was thus in danger of falling. Thomas Tompion's clock was ordered to be repaired and placed in the cupola of the Grand Storehouse.[6]

The Record Office In July 1715, in an effort to improve the storage and preservation of its records, the Ordnance tried to take over the lodgings assigned to the Constable of the Tower in and about the Lanthorn Tower.[7] The move failed and as a consequence on 23

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1. WO 47/29, f. 104. Whether this is the same design that was eventually built is not clear. It should be noted that the surviving draft is dated 1717.
2. The principal building accounts are, Carpenter: WO 51/99, ff. 41-2; Bricklayer: WO 51/100, p. 62; Mason *ibid.*, p. 88; Painter: WO 51/101, f. 81; Joiner: WO 51/102, f. 86.
3. WO 51/16, f. 109; WO 51/19, f. 215.
4. Tompion's subsequent payments for maintaining the clock are found in WO 50/2, *passim.*
5. WO 51/18, f. 115.
6. WO 47/20A, f. 152; WO 51/97, f. 13.
7. WO 55/405, p. 6.

February the following year the Board ordered part of the upper floor of the old powder house against the east face of the White Tower, the Sword Room as it was then designated, to be 'fitted up for a Repository for All the Draughts, Planns & projects belonging to the Office, & also for the Old Books and Records of the Office, which are of the late Yeares Grown Numerous'.[1] Subsequently, on 5 July 1717, a certain Sebastian Smith was appointed archivist, on a generous salary of five shillings per day, to sort and classify the department's books and papers that were to be transferred into the new establishment.[2] Beginning on 7 October the following year, Smith was assisted by a stationer, Abraham Lane, who was appointed 'to deliver Stationary Warres, Bind Books, sort Papers &c' on a salary of three shillings per day.[3] In April 1719, William Lloyd became archivist, after Sebastian Smith retired on grounds of poor health.[4] The compliment of the office was thereafter increased to three with the appointment in April 1722 of Fenwick Petra as an assistant on a salary of one shilling and six pence per day.[5]

The Drawing Room The second facility established on the upper floor of the building against the east face of the White Tower during 1716 was the Drawing Room. The need for this derived from the growth of a permanent survey section at the Tower to cope with the cartographic needs of the Ordnance. Since the Restoration most drawing skills had been provided by the engineers as indicated by the Instructions issued to the Chief Engineer in 1683 which required him to

> 'be well-skilled in all parts of the Mathematicks, ... To take Distances, Heights, Depths, Surveys of Land, Measures of solid Bodies, and to cut any part of ground to a porportion given; ... and to be perfect in Architecture, civil and military, ... to draw and design the situation of any place, in their due Prospects, Uprights, and Perspective'.[6]

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1. WO 47/29, f. 98.
2. WO 47/30, p. 143.
3. WO 50/7, f. 89, *passim*.
4. WO 47/32, p. 141.
5. WO 50/7, f. 135, *passim*.
6. Clode (1869), Vol. I, pp. 464-5.

On occasions, however, the Ordnance commissioned private map makers to survey sites and produced drawings. For example, in January 1670 Ralph Greatorix was paid for taking a survey and making a plot of the house and grounds of the late Sir William Pritchard at Woolwich,[1] and just over two years later for providing a detailed survey of Windsor Castle, the town and its environs.[2] Furthermore, in October 1676 Ernest Henry De Reus had an account settled for surveying and mapping the Island of Sark.[3] Cartographers could expect a wide range of commissions, thus in 1688 when the engineer Holcroft Blood was producing a survey of the Tower of London (see **VI** & **VII**, pp. 160-61 & Figs. 55 & 56 below), we also find him preparing five drafts for firework displays on the river Thames.[4] After he joined the establishment in 1696, Blood was tasked with producing an extraordinary set of drawings depicting 'all the Incampments, Battles, Skirmiges, seiges &c that shall or may happen during the Campaign in Flanders'.[5]

The Ordnance seems to have engaged its first permanent draughtsmen in January 1694 when the Board appointed Lucas Boitout to the establishment for the sole task of 'Making, Draughting, and preparing such Plans, or Draughts ... as shall bee Required and Directed By the Master General ... or Principal Officers'.[6] Boitout continued to receive his quarterly salary at the rate of three shillings per day until the end of 1697, when his name disappears from the records.[7]

After a lapse of some twelve years, a new chapter opened after Brigadier Michael Richards, the Ordnance Surveyor-General, recommended to the Board that they appointed a draughtsman as part of package of measures to improve the recording and documenting

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1. WO 51/10, f. 41.
2. WO 51/14, f. 20.
3. WO 51/19, f. 43.
4. WO 51/37, f. 207.
5. WO 47/18, p. 201; WO 50/2, f. 72, *passim*.
6. *Ibid.*, f. 7. Where Boitout worked in the Tower is not clear, though it is worth mentioning that in March 1687, William Damsell, joiner, was paid £34 for two large walnut map cases which were placed in the Withdrawing Room of the Coldharbour office, WO 51/36, f. 33.
7. WO 53/3, f. 1.

of all activities associated with the Office's building programme.[1] Almost immediately, on 15 April 1712, the Board appointed a certain Robert Whitehand as a 'Draughtsman ... Constantly to attend the Office' on a salary of £25 per quarter.[2] Whitehand was to occupy the position of Chief Draughtsman until March 1723,[3] during which time the first stage of the evolution of the Drawing Room was completed.

Whitehand to some extent must have been involved in the commissioning of the then young, but up-and-coming, Andrews Jelfe, to make several 'Draughts for the use of the Office' between 1 July 1716 and 24 February 1718.[4] Jelfe prepared a second set of drawings of buildings and fortifications between 1 October 1718 and 20 March 1719,[5] and it was during this period that he was, by warrant dated 16 January 1719, appointed inaugural 'Architect and Clerk of Works' to the Ordnance.[6] Whereas there is no certain evidence to indicate that Jelfe operated from the Drawing Room at the Tower, the next draughtsman to be engaged by the Office, Clement Lemprière, certainly did. Lemprière was a highly talented cartographer who evidently originated from the Island of Jersey.[7] He was one of the most influential appointments to the eighteenth-century Drawing Room and at the time of his death in July 1746 occupied the post of Chief Draughtsman at the Tower.[8] Lemprière began work at the Tower on 23 December 1716.[9] One of his earliest surviving drawings is that of the building attached to the east side of the White Tower wherein the Drawing Room was located (see Fig. 29 below). In the years that followed, Lemprière's bills indicate that at times he could be found surveying in Ordnance depots such as Woolwich and Chatham, while during September and October 1719 he

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1. B.L., Stowe MS. ff. 3-5.
2. WO 50/6, f. 112.
3. WO 50/7, f. 141.
4. WO 51/101, f. 3. For a synopsis of Jelfe's career, see entry in Colvin (1978).
5. WO 51/102, f. 42.
6. WO 55/490.
7. See entry in Belleine (1948).
8. *Gentleman's Magazine xvi* (1846), p. 383.
9. WO 47/30, p. 105; order of the Board to pay Lemprière for the period 23 December 1716 to 13 April 1717 at the rate of three shillings per day.

accompanied the Surveyor-General on a visit to France.[1] Otherwise, however, he seems to have spent much of his time at the Tower.

Another person who briefly joined the Drawing Room team was a certain John Hargraves who in November 1718 was paid £20 for taking a survey of Woolwich Warren and for preparing drawings at the Tower.[2] The final addition to the staff at this early date was Richard Barton, who arrived on 13 April 1721 to begin 'Copying, Contracting, and Reducing Draughts' at a rate of two shillings per day,[3] and who by the end of 1752 was still employed in the Drawing Room as a senior draughtsman on the rate of five shillings per day.[4]

The Modelling Room This was the third department established on the ground floor of the building annexed to the east side of the White Tower during 1716. Its function, at least to begin with, concerned efforts to standardise and regulate the production of artillery and gun carriages for land and sea service. The man generally accredited with overseeing the task was Colonel Albert Borgard who, in his memoirs, records that he 'was ordered by the Board of Ordnance to lay before them tables and draughts of all natures of brass and iron cannon, mortars, &c. which was done accordingly, and approved of'.[5] Borgard received his instructions on 20 July 1716, but it seems clear that some work had already been carried out, for on the same day the Board considered a memorial from Jonathan Lewis and George Michelson in respect of seven months work they had each performed during 1715 'making Draughts of Gun Carriages' and 'drawing Gunns &c in the Tower'.[6] In two subsequent bills Michelson is described as preparing drawings 'at the Surveyor General's' under Colonel Borgard's direction.[7] In June 1715, the Surveyor-General, Michael Richards, took dimensions and mouldings of brass and iron

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1. WO 51/104, f. 98.
2. WO 51/101, f. 37.
3. WO 51/107, f. 113.
4. WO 51/179, f. 48.
5. Duncan (1879), p. 96. For a discussion of Borgard's contribution, see Caruana (1982).
6. WO 47/28, p. 339; WO 47/29, pp. 170-1.
7. *Ibid.*, pp. 242 & 294; WO 47/30, p. 219.

ordnance,[1] and there seems little doubt that it was under his supervision that Lewis and Michelson carried out their preliminary work.

Since the Restoration there is evidence that at least some of the Board's orders to gunfounders and carriage makers was delivered by way of drawings and models.[2] Now the task was to be regularised and carried out by specifically employed staff. In July 1716, therefore, Samuel Gibbs, who had produced a survey of Sheerness for the Ordnance in 1715,[3] was assigned to work with Michelsen in the preparation of pattern drafts at a rate of one shilling per day.[4] In August 1718, still 'drawing Plank Wheels, Standing Carriages, Iron Ordnance &c by direction of Col Borgard', Gibbs had his fee increased to two shillings per day,[5] while at the end of the previous year Michelsen began to draw his pay on the quarterly list.[6] Between May and December 1716 a certain Thomas James was paid for modelling gun carriages, etc, under the direction of Colonel Bogard,[7] and as from 1 October 1717 began to receive a regular salary for 'attending and making Modells of Carriages for Guns & Mortars &c'.[8] James, who in 1715 is described as a gunner stationed at Newport,[9] can be regarded as the first appointment to the post of Ordnance Modeller and he must have played a crucial role in the setting up of procedures to standardise and regulate the production of gun carriages. In addition to making models he was able to draw.[10] The former skill was not confined to guns, as evidenced by a extraordinary payment James received in August 1718 for making a model of the

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1. WO 51/94. f. 185.
2. *Cf.* WO 51/3, f. 175, payment to Thomas Bayley dated October 1662 for 'paynting and laying in Collour upon 5 skynes of Vellome the modell of one brass Culvering of 10 foot long with a scale'; WO 51/35, f. 138, payment to Peter Dorousseau dated 22 December 1687 for 'making a Moddell of a Mortar piece on a Mortar piece Carriage'.
3. WO 47/26, p. 256.
4. WO 47/29, p. 171.
5. WO 51/103, f. 22.
6. WO 50/7, f. 69.
7. WO 47/29, p. 297.
8. WO 50/7, f. 69.
9. WO 47/28, p. 117.
10. WO 51/102, f. 4, for an extraordinary payment to James dated December 1718 for 'making Draughts, Modells, and settling the Proportions of Carriages and Ironwork for the same'.

fortifications at Mardyke, near Dunkirk.[1] On occasions James or his assistant evidently commissioned models, as indicated in July 1726 when Messrs Peters and Remnant delivered eight 'Iron Guns for Modells Turned and bored to a 2 Inch scale' and another seven of *lignum vitae* into the Modelling Room.[2] These scaled down replicas were probably made for the benefit of the Board, rather than any manufacturer. In March 1722 James, now elevated to the rank of Lieutenant, produced 'his Book of ARTILLERY at the OFFICE of ORDNANCE at the TOWER OF LONDON'.[3] This is an illustrated, pocket-sized, manual containing detailed tables of the measurements of guns and gun carriages. It was clearly intended to assist James as he inspected military installations to survey artillery and direct the repair of gun carriages.[4] Beginning in October 1720, he was assisted in this task by another model maker, Francs Witherby, who was employed at the rate of 20d per day.[5]

(iii) LODGINGS

According to the 1683 Instructions, Ordnance officials were required to 'make their Ordinary Habitations and Aboad in the houses and Lodgeings Assigned them in or neare the Tower'.[6] This directive placed considerable pressure on the available accommodation at the Tower and the Ordnance was not always able to meet demand. The general expansion of the Office during the late seventeenth and early eighteenth centuries, especially in terms of the number of clerks employed,[7] clearly contributed to a shortage of accommodation. The Board perceived this shortage as having a detrimental effect on its operations, but nevertheless it was not uncommon for officers to rent their lodgings

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1. WO 51/103, f. 22.
2. WO 51/119, f. 31.
3. Royal Artillery Institution MS. G3n/1a.
4. *Cf.* WO 51/116, f. 99.
5. His first payment, for 'Modelling Carriages, Wheels, &c' for the period between 17 October 1720 and 31 March 1721 appears in the Bill Books, WO 51/107, f. 62, thereafter his salary is recorded in the Quarterly Books, WO 50/7, f. 120 *et seq.*
6. R.A., AL3; WO 55/536. It might be noted that no official could be arrested or imprisoned by the City authorities without the consent of the Master-General or, in his absence, the Lieutenant-General, see PC 6/18, p. 70.
7. Tomlinson (1979), p. 14, has calculated that for the September quarter of 1660 payments were made to only nine clerks, but by 1703 this had dramatically increased, with seventeen permanent clerks and twenty-one extraordinary clerks in the Office.

and reside outside the Tower. In an effort to curb the practice, the Board, in April 1719, ordered that no further houses were to be let without their approval.[1] Conversely, the Board was ready to rent from individuals connected with other departments in the Tower, as in the case of the Yeoman of the Robes, whose house during the 1670s and 80s was leased for the Keeper of Small Guns, and the Warden of the Mint, whose lodgings during the 1690s were rented for the Lieutenant-General.[2] Such accommodation could not also be secured, however, and as a consequence allowances sometimes had to be paid to officers obliged to live outside the Tower.[3]

Ordnance lodgings were to be found in almost any part of the Tower, but with several concentrated against the rear of the curtain wall between the Martin and Broad Arrow towers and in and about the Lanthorn and Devereux towers.[4] One of the largest was that assigned to the Master-General who, evidently in 1642, had transferred his accommodation from the Brick Tower to a rambling arrangement centred on the Lanthorn Tower (see p. 22 above).[5] In March 1661 some repairs and redecorations to these lodgings are recorded, including the painting of the great room in a white colour 'vaild

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1. WO 47/32, p. 157.
2. *Cf.* WO 51/16, f. 72; WO 51/27, f. 1; WO 51/42, f. 48.
3. Jonas Moore received an annual allowance for having no lodgings at the Tower until he assumed the post of Surveyor-General at the end of 1669 (WO 51/10, f. 72), while the Clerk of the Deliveries during the 1660s, 70s and 80s received an annual allowance 'in consideracon that hee hath not a Dwellinge Howse in the Tower appropriate to his Office and place where hee ought to [be] inside for the better performinge of his Majesties service' (*cf.* WO 51/4, f. 119; WO 51/16, f. 155; WO 51/27, f. 1). James Leece, clerk to the Treasurer during the 1690s, also received a quarterly payment for having to rent accommodation outside the Tower, *cf.* WO 51/45, f. 63.
4. It is not always possible to detect the exact whereabouts of some lodgings or, on occasions, to identify their inhabitants. A good example is the large crenellated building that stood at the west end of the Wharf, which on the 1688 survey is labelled `Banbury Castle' (see Fig. 55 below). This would seem to relate to a house assigned to a Mr Banbury in accounts dated 1670 (WO 51/12, ff. 5 & 39). The only person by the name of Banbury who appears in other Ordnance accounts at this time is Benjamin Banbury (*c.f.* WO 51/11, f. 32), a gun engraver. However, he does not appear to have drawn an Ordnance salary and under normal circumstances would not have been entitled to lodgings at the Tower.
5. In March 1669 Samuel Pepys notes that the Brick Tower was occupied by the son of Major Bayley, the Master-General's secretary, Latham & Matthews, eds. (1970-83), Vol. IX, p. 468. By 1715 it had become the residence of the department's Chief Bombardier, Jonas Watson (see **XIX**, p. 164 below).

and revaild with a Flower du Luce guilded in each pannell'.[1] The lodgings were extensively refurbished during the mastership of Sir Thomas Chicheley and at a time when they were occupied by Samuel Fortrey, Clerk of the Deliveries. Bills settled in November and December 1675, list rooms within the upper floors of the Lanthorn Tower, an adjoining gatehouse over the Outer Ward and a slender tower, named Queen Elizabeth's Tower, overlooking the river to the south.[2] By 1690, the Queen Elizabeth's Tower had been separated from the main accommodation to become the lodgings for a clerk to the Clerk of the Deliveries.[3] It was probably during the mastership of George Legge (1682-9) that responsibility for the Master-General's apartment passed from the Ordnance to the Office of Works, evidently because Legge also occupied the post of Constable of the Tower. In 1715, in an effort to re-establish control over the apartment and integrate it with their adjoining administration office, the Board asked the Master-General to raise the matter of the lodgings with the King, claiming that the Constable never stayed there and that the rooms were empty.[4] If pursued, the claim must have been unsuccessful, for within a few years the apartment was occupied by one of the Constable's subordinates, the Major of the Garrison. Thereafter it was occupied by successive majors almost until 1774 when fire devastated this part of the fortress.[5]

A fairly detailed picture of another large Ordnance lodging, that assigned to the Surveyor-General next to the Constable Tower, emerges from records associated with the death of Sir Jonas Moore in August 1679. A surviving probate inventory exhibited in court on 2

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1. WO 49/96, f. 123.
2. Joiner: WO 51/18, ff. 94-5; Mason: *ibid.*, f. 112; Painter: *ibid.*, f. 123; Carpenter: *ibid.*, f. 167. The rooms named are the kitchen, the room next to the kitchen, the two lower rooms and an adjoining room, the room under Queen Elizabeth's Room, three great rooms and a room at the great stair head, the middle room, the room next to the Ordnance Office, the great stairs and two rooms next to the Thames.
3. WO 51/42, f. 63. Prior to this, however, the tower seems to have been temporarily assigned to the Lieutenant of the Tower. See WO 47/9, f. 27, for a reference to the Master-General Commissioners borrowing a copy of the King's warrant of 23 April 1680 transferring the property to the Lieutenant.
4. WO 47/28, f. 180; WO 55/405, p. 6.
5. Parnell (1985b), pp. 37-40.

October 1679 lists the contents of a fourteen-room building and summer house.[1] The overall impression is one of comfort and some opulence. The 'Greate Chamber or Yellow Chamber' was decked out in 'woosted Camblett' with linings of 'Yellow French sarsnett' and matching chairs. Moore's own room contained a carpet, several chairs including 'a sweateinge chaire'[2] and a pendulum clock together with his bed. In the Dining Room were three Spanish tables, a couch, chairs and numerous pictures including 'the Kinge and Queenes ... the Duke of York and General Monkes pictures'. Elsewhere there were an abundance of soft furnishings, a large looking-glass, another clock, plate valued at more than £100 and a well-equipped kitchen. The value of the accommodation is indicated by the £60 paid for fifteen weeks rent of it in the summer of 1681, when the authorities noted that Jonas Moore Junior (who occupied his father's post) had 'a great house for himself and very cool this hot weather' and took it over to lodge the imprisoned Lord Shaftesbury who was then seriously ill in a claustrophobic Warder's lodging.[3]

When Sir Bernard de Gomme occupied the post of Surveyor-General at the end of July 1682, after the death of Sir Jonas Moore Junior, the old lodgings were again subject to extensive repair and renovation. The floors of the two principal storeys, together with the cellar and garrets, were re-boarded. New stairs and partitions were installed, the roof re-tiled, windows introduced into the cellar, some 523 yards of counterfeit stonework applied (presumably to the exterior wall faces), chimneys and fireplaces repaired and a host of other small works carried out.[4] The house was ordered to be repaired again upon the appointment of John Charlton in July 1689.[5] This proved to be its last repair, and Charlton its last occupant, for in 1699 the building was demolished (see pp. 103-4 below).

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1. PROB 4/18757. A supplementary probate, PROB 5/4229, dated 13 May 1680, records payments to a housekeeper and at least five servants and notes that there were ten chairs in the servants' dining room.

2. Evidently a reference to the 'sweating presse' (steam-bath) made for Moore's bedchamber between 2 November 1672 and 18 January 1673 (WO 51/15, f. 177) to help cure his sciatica, see Willmoth (1993), p. 152.

3. *Cal. SP Dom. 1680-81*, p. 405.

4. WO 51/26, ff. 186-9.

5. WO 51/40, f. 119.

Immediately to the south of the Surveyor-General's house stood a group of three Ordnance houses with walled gardens attached (see Fig. 49 below), one of which was evidently assigned to the Chief Engineer. In 1688, while Martin Beckman occupied the post, four substantial windows, three 10ft 9in x 9ft 6in, the other 12ft 4in x 9ft 7in, were introduced into the lodgings through an old wall some 8ft 6in thick.[1] This very thick masonry is perhaps best interpreted as the inner curtain wall and indicates that Beckman's house was built hard against the medieval defences.

The status of officials, as the case of Moore demonstrates, was inevitably reflected in the quality of their lodgings, though evidence shows that what the 1683 Instructions described as 'inferior officers' (i.e. personnel who reported to principal officers) could expect to enjoy high standards of accommodation. A good example is that of Captain George Wharton, clerk to the first post-Restoration Lieutenant-General, Colonel William Legge. Both Legge and his clerk had accommodation in the Little Minories, the Tower Liberty to the north of the fortress (see pp. 14-5 above), but between March and June 1662 the Ordnance 'payhouse', the former Bowyer's lodgings situated immediately to the east of the Wakefield Tower (see p. 13 above), was extensively refurbished to receive Captain Wharton and his family. In several rooms quite lavish interiors were created with panelling and *trompe l'oeil* schemes applied by the Office master painter, Thomas Bayley. In a room set aside for Colonel Legge some 124 yards of illusory white marble was painted in panels 'vaild & revayld' with a gold flower pot in each panel. Elsewhere in the room a smaller number of 'Cloath Counterfeited' panels were created, again adorned with gold flower pots. In an adjacent room more white marble was applied with gold flower pots painted in the windows, while Captain Wharton's closet was decorated with a 'faire green Collour' both directly on the walls and onto cloth to serve as hangings. In his dining room more white marble was created and in the next room, probably the room listed as the 'Chamber over the Kitchen' in the joiner's account, Bayley applied some 65 yards of 'wall nuttree colour with a Counterfeit cornish'. Panels of 'Waynscot collour' and 'Gould Counterfeitinge' were painted in the pay room while an adjacent room was decorated 'a box Collour knotted'. Finally, under the heading of 'Kitchen & doares'

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1. WO 51/37, f. 180.

some 78 yards of wainscot colouring is listed together with 24 yards of counterfeit 'rayles & bannisters' painted white. Many of the fire surrounds in the house were painted, with that in Colonel Legge's room being additionally gilded.[1]

The subsequent history of the Pay House, which after the promotion of Captain Wharton to the post of Treasurer in 1670 is invariably referred to as the Treasurer's House, is of some interest. In a petition read before the Privy Council on 11 April 1666, the Keeper of the Record Office at the Tower, William Prynne, challenged Ordnance jurisdiction over the building, described then as a 'chamber house, containing 11 rooms besides those built in the garden'.[2] Prynne claimed that the house had formerly been occupied by the Record Office as an amenity to the depository in the Wakefield Tower, and that since Captain Wharton had taken up residence there his staff had no fire near at hand to warm themselves, and were hindered in sorting, transcribing and making tables of records. In a second petition read before the King on 20 December 1667, Prynne continued to press his claim, stating that although the building had 'anciently' been inhabited by a certain Jefferson, who held the post of Ordnance Master Bowyer and 'whose Office long since ceased with him', the Lords of the Council had in more recent times transferred the property to the Keeper of the Records.[3] The outcome of the dispute is shown in a number of building accounts which record the cost of providing Captain Wharton with new rooms at the Pay House in 'lieu of those taken from him by William Pryn'. The redefined Pay House was located north and east of the disputed property (see Fig. 3 below), which thereafter was known as the Record Office until its demolition in the 1880s. Work on the new accommodation seems to have begun shortly after a contract was signed with the bricklayer in September 1668 and must have been completed by June the following year when the builders' accounts were settled.[4]

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1. Painter: WO 51/3, f. 141; Joiner and Carpenter: *ibid.*, f. 143; Plumber and Plasterer: *ibid.*, f. 142; Mason: WO 53/415, entry 726.

2. *Cal. SP Dom. 1665-66*, p. 346.

3. WO 55/425, f. 215.

4. Bricklayer: WO 51/10, ff. 75-6; Carpenter: *ibid.*, ff. 76-7 & 79; Plasterer and Glazier: *ibid.*, f. 80; Ironmonger: *ibid.*, f. 95; Painter: *ibid.*, f. 79.

After his promotion to Treasurer, Captain Wharton's house was again enlarged in 1672-3.[1] Once more sumptuous *trompe l'oeil* interiors were created, the master painter, Valentine Bayley (son of Thomas Bayley, who executed the earlier decorative schemes) producing, amongst other things, panels of imitation 'Tortois shell' with reveals of 'Cabenett Wood as if inlay'd with Ivory' and 'Knotted and Coloured ... Olive Tree Cabonett Wood'.[2] Following this work, and perhaps in an attempt to provide the house with greater architectural cohesion, the north front was taken down and rebuilt in 1677.[3] The elevation was reconstructed again in 1718.[4]

Most of the building work associated with the Ordnance accommodation at the Tower during the late Stuart period was concerned with repair and refurbishment. Among the few completely new buildings erected at this time were three in 1686. One of these,[5] built for John Whiteing, clerk to Sir Edward Sherborne, the Clerk of the Ordnance, occupied the site of the present No. 2 Tower Green, the resident doctor's house, built in 1735 and standing against the inner curtain wall immediately north of the Beauchamp Tower.[6] On a drawing of 1717 (see Fig. 30 below) the house is labelled 'Mr Whites house', evidently a reference to Thomas White who secured the senior clerk's post after the death of John Whiteing in 1702. Of the other two houses built in 1686, the larger,[7] its site unknown, was for James Rothwell, Assistant Surveyor, the other[8] was for the Office Labourer, William Parker, and was located at the west end of the Chapel of St Peter ad Vincula (see Fig. 3 below).

By far the most prodigious new domestic accommodation to be built at this time was a pair of great houses for the Surveyor-General and Clerk of the Ordnance. The houses were erected between 1699 and 1701 against the rear of the curtain wall between the

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1. WO 51/17, ff. 63, 117 & 150.
2. *Ibid.*, f. 3.
3. WO 51/20, f. 34.
4. WO 47/31, p. 34.
5. WO 51/33, ff. 69 & 87; WO 51/34, f. 148.
6. For a draft of the 1735 house see WORK 31/154 and WO 51/133, f. 24 & WO 51/137, f. 114, for bills for the demolition of the old house and the erection of the new one.
7. WO 51/33, ff. 111, 139 & 149.
8. *Ibid.*, ff. 69 & 87-8.

Martin and Constable towers on the site of three earlier lodgings occupied by the Surveyor, Clerk and Storekeeper (see Fig. 3 below).[1] The Surveyor was to occupy the northernmost of the two new houses, the Clerk the other; where the Storekeeper was rehoused is not clear.[2] The scale and quality of the new houses is reflected in the building costs which well exceeded £4,000.[3] Half H-shaped in plan and measuring some 90ft x 48ft, the building comprised three floors and an attic constructed over a semi-basement (see Fig. 31 below). With simple proportions and steeply pitched roof above a boldly projecting cornice, the appearance of the building owed much to the prevailing Dutch architectural style of the late seventeenth century. A curious feature was the fenestration to the roof storey which, with its alternating segmental and triangular pediments, seems to echo an earlier, almost Jonesian, architectural tradition for which the late Stuart Office building record otherwise offers no examples. In May 1722 a warrant was issued to excavate some ground against the north side of the of the houses to allow three brick vaults to be constructed for the convenience of the Surveyor-General. A plan of the proposed addition was prepared during June (see **LXIV**, p. 174 below) and by the end of September the master scavelman was being paid for digging and removing some 238 cubic yards of earth and for subsequently packing clay over the finished vaults.[4] Small, but interesting, additions were made during the following year when porches were placed against the entrances of both houses. The master carpenter, William Ogborne, received £90.03s.09½d for making 'two Porches of the Doric Order compleat with proper Ornaments', which came with two panelled doors, presumably to replace the existing entrance doors. The stonework for the circular bases of the columns, the square

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1. The Clerk's lodgings were refurbished for the last time upon the appointment of Sir Thomas Littleton in March 1690. The bills for the work (WO 51/40, ff. 118-9) attribute the house to Charles Middleton who, at the eleventh hour, proved to be an unsuccessful candidate for the post of Clerk, Tomlinson (1979), p. 74.

2. Compensation for the period when the three officers were without accommodation in the Tower began to be paid on 25 March 1699, see WO 51/60, f. 11.

3. Bricklayer: WO 51/61, f. 57 & WO 51/68, ff. 86-7; Carpenter: *ibid.*, f. 85 & WO 51/66, f. 2; Mason: WO 51/67, f. 108; Joiner: WO 51/68, f. 12; Purveyor: WO 51/63, f. 111 & WO 51/88, f. 87; Glazier WO 51/64, ff. 8 & 12; Painter: WO 51/66, f. 12.

4. WO 51/111, ff. 31 & 37.

bases for the 'four Plaisters in the two Porches' and the steps was provided by the master mason, Robert Churchill.[1]

The early Hanoverian period saw something of a surge in work associated with Ordnance accommodation. One of the first buildings to attract attention was the 'Martins' [Middle] Tower at the western entrance. Until it was converted into quarters for the garrison, following recommendations made in 1679 (see pp. 48-9 above), the gatehouse had served as the lodgings of the Porter of the Mint. By 1715, however, it had become the official residence of the Ordnance Barrack Master[2] and in July that year, having been informed of its poor state of repair, the Board ordered the battlements to be reduced in an effort to secure the structure temporarily.[3] Instructions to take down the building as low as the Surveyor-General deemed appropriate were issued on 6 March 1716[4] and during the following year Clement Lemprière produced a series of detailed drawings in advance of restoration work (see Figs. 32 & 33 below). Between 1717 and 1719 the external elevations were extensively resurfaced with Portland stone by the Office mason, Robert Churchill, who also introduced new Romanesque-style windows and doorways similar to those he had recently installed in the White Tower (see Fig. 34 below). The projecting medieval timber framing over the rear of the gate-passage was taken down and replaced with stonework while the interior was refitted throughout.[5] The arms of George I, above the outer gateway, were carved and installed by Thomas Green for the sum of £36.[6]

On 8 April 1718 the Board approved an estimate of nearly £3,000 to build a terrace of four houses against the rear of the curtain wall between the Constable and Broad Arrow towers (see Fig. 3 below). A scheme had been laid before them during the previous January but even before the formal decision to proceed was taken four old houses on the site were demolished.[7] A surviving plan (see Fig. 35 below), elevation and section of

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1. WO 51/113, f. 101; WO 51/114, f. 19.
2. WO 51/95, f. 24.
3. WO 47/20A, f. 119.
4. WO 47/29, f. 104.
5. WO 51/100, p. 87; WO 51/102, ff. 103-4; WO 51/103, ff. 94-5; WO 51/105, f. 63.
6. WO 47/30, f. 217; WO 51/102, f. 9.
7. WO 47/31, p. 97; WO 51/101, f. 70.

the proposed terrace shows a three-storeyed range over a basemented terrace; the design follows very closely the building that was actually constructed in 1718-9 and which, albeit partly rebuilt, survives to this day (see pp. 133-4 below).[1] The terrace compares very closely with a row of four officers' houses built by the Ordnance at the same time and by the same contractors at Woolwich.[2] The drawing for the Tower terrace further indicates the houses were intended for the Storekeeper of the Small Gun Office and three senior clerks assigned to the Lieutenant-General, Clerk of the Ordinary and Storekeeper.[3] The Keeper of the Small Gun Office had evidently occupied the Flint Tower since 1669[4] and his departure enabled the building to be converted into a workshop (see p. 109 below).

During March 1719, in a move that must have infuriated the officers of the Mint, the Board gave orders for a workshop attached to the smith's house in the Outer Ward to be converted into a dwelling for an Ordnance clerk.[5] Moreover, two new houses were ordered to be built opposite the shop on ground formerly occupied by one of the smith's forges (see Fig. 3 below).[6] All three houses were intended for Ordnance clerks and they were presumably ready for occupation by June 1721 when the outstanding builders' accounts were settled.[7]

On 1 and 8 May 1719 warrants and contracts were issued for the reconstruction of the house of Mr Levin, clerk to the Clerk of the Deliveries, located against the external angle of the inner curtain wall and the Lanthorn Tower opposite the Cradle Tower (see Fig. 3 below).[8] A rudimentary plan and three-dimensional elevation of the proposed new building, whose estimated cost of construction was £456.13s.09½d, survives (see Fig. 36

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1. The principal building accounts are found in WO 51/102, ff. 79 & 86; WO 51/104, ff. 1-3, 10, 14-5 & 47-8.

2. These four houses are the present Nos. 1 and 2 Dial Square, Hogg (1963), Vol. I, pp. 254, 264 & note 186. It may be noted that the entrances to these houses are also provided with enclosed porches identical to those that can be found against the contemporary barrack block at Upnor Castle.

3. WO 47/32, p. 155.

4. WO 47/19A, f. 86.

5. WO 47/33, p. 153. The estimated cost of work was £306.18s.11½d.

6. *Ibid.*, p. 159. The estimate in this case was £926.19s.10½d.

7. WO 51/107, ff. 72-3; WO 51/108, f. 44; WO 51/109, ff. 90-4; WO 51/110, f. 31.

8. WO 47/32, p. 189.

below). Dated 13 June 1719, the drawing depicts a simple two-storeyed structure built over a semi-basement around a small 'Area' or courtyard. The principal south elevation is divided into five bays with the centrally placed entrance, dressed with a raised and shouldered surround, reached by a small flight of steps. Windows with segmental arches light the ground and first floors while openings with flat arches serve the basement; the roof is lit by a single lunette in the eastern gable. The principal builders' accounts were settled during September and December 1719 thus indicating that the house was constructed in a little more than six months,[1] though the painter's work, which included 641 yards of interior surfaces painted pearl colour, was not undertaken until early the following year.[2]

(iv) WORKSHOPS

The various Ordnance workshops at the Tower during the later Stuart era were concentrated on the Wharf and on the hill north-west of the White Tower. A notable exception was the house and forge assigned to the resident master blacksmith located in the Outer Ward opposite the Bowyer Tower (see Fig. 49 below). This lay in the heartland of the Mint, and as already indicated, its presence was a constant source of friction between the officers of the Mint and the Ordnance. On 27 April 1667, the Privy Council instructed the Ordnance to remove the forge to 'that void place at Iron Gate, or into such other place as shall be Judged convenient for securing from accidents by fire'.[3] With no apparent action having been taken the issue was brought before the Council again twelve years later. The Mint protested about diverse inconveniences because of 'soe many persons continuing to inhabit, and worke within the Mint ... who have no right soe to doe'. The presence of the Ordnance smith 'makeing and fitting double headed shott, and all sorts of iron worke' was clearly in contradiction of the Council's earlier instructions which the Mint sought to have enforced. Furthermore, it was requested that when the smith moved, all houses, cellars, shops, warehouses and other buildings associated with his operations should be left in good order so that the Mint could put them to alternative use. The Council upheld the petition and directed the Ordnance to relocate

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1. WO 51/104, ff. 11 & 111; WO 51/105, ff. 69 & 97.
2. *Ibid.*, f. 116.
3. WO 55/332, p. 141.

the smith in the gardens on the south side of the curtain wall between the Salt and Lanthorn towers, or to some other site within their jurisdiction.[1] Again, however, there is no indication that the Council's instructions were complied with and on 5 August 1699 the officers of the Mint complained to the Treasury about further developments on the site. They argued that the smith had formerly worked only for the Mint, but the 'Office of Ordnance haveing for some yeares employed our Smith, & built themselves conveniencies at his shopp, & perhaps done some repairs to his house, they have now without our leave pull'd downe the whole house, being a large place 90 foot long ... & are laying Foundations of a new house there, as if the place were their own, Our Smith (as wee suspect) trecherously prompting them to it for his own ends'. The Lords Commissioners accordingly arranged a site inspection with representatives of the Mint and the Ordnance to investigate the dispute and to determine to which department the property had anciently belonged.[2] The outcome of the investigation presumably favoured the Ordnance for, during 1700-1, they pressed ahead with the reconstruction of the smith's house and shop.[3] It would appear that the smith continued to operate from his enclave in the Mint till at least 1719 when the Board ordered some of his facilities to be adapted for residential use (see p. 106 above). This may have been linked to the subsequent appearance in 1724 of a workshop for the smith on the Wharf[4] where it congregated with other Ordnance artificers sheds and shops erected in 1716-7.[5]

The sale of the old Artillery Ground in the Minories north of the Tower in 1682[6] saw the transfer of operations associated with the proving of small arms to the Tower. As a consequence, contracts for the construction of a new 'Proofe house and Chargeing house upon Tower Wharfe' were signed with the carpenter and bricklayer during August 1682,

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1. PC 2/68, pp. 194-5; PC 6/18, pp. 164-5.
2. WORKS 3/1. The relevant correspondence has been printed in *Wren Soc. Vol. XVIII* (1941), pp. 151-2.
3. WO 51/61, f. 57; WO 51/62, ff. 11-12 & 96-7; WO 51/63, f. 49.
4. For the accounts for building the workshop see WO 51/115, f. 41 & WO 51/116, f. 28. A survey of the east end of the Wharf dated 1724 (WORKS 31/216) identifies a smith's shop immediately to the east of the Proof House. For a later drawing showing a similar arrangement, see WORKS 31/215.
5. WO 51/100, f. 73.
6. *Cal. Treas. Books, 1681-85*, pp. 305-7.

the work evidently completed by January 1683 when the bills were settled.[1] The new buildings, which stood either side of the gate in the defensive wall at the east end of the Wharf (see Figs. 2 & 54 below) were essentially masonry structures supporting lead roofs.[2] In 1709 the proof house was pulled down and a new building with ragstone walls was erected on the same site at a cost of over £400.[3]

The vacation of the old Ordnance office behind the Chapel of St Peter ad Vincula in 1673 (see pp. 37-9 above) seems to have provided the opportunity for the Furbisher of Small Arms to establish himself on the site. In a seemingly dangerous distribution, it would appear that the main body of the old office was occupied as the residence for the Furbisher with attendant shops and forges for him and his assistants while the large semi-basemented vaults below were used to store saltpetre and grenades.[4]

In 1714 one of the Furbisher's shops was pulled down and rebuilt by the Ordnance carpenter.[5] A more ambitious programme of reconstruction was undertaken the following year after the Board approved an estimate in April for 'rebuilding Shops for Furbishers & Gunsmiths to work in at or about Deverells [Devereux] Tower' at a cost of £465.11s.03d.[6] The presence of gunsmiths in this area is also recorded in a survey of the Devereux Tower dated 1715, in which the building is labelled the 'Gun smiths apparttment' (see Fig. 37 below). Between April and June 1715 the Furbisher's house, the old Building att the Deverells Tower', was largely demolished and during the following months new lodgings together with workshops for him and the gunsmiths were erected on the site (see Fig. 3 below).[7] It was probably during this operation that the old medieval chamber block attached to the south side of the Devereux Tower (see p. 54 above) disappeared. Additional facilities for the furbishers were provided in the Flint

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1. WO 51/26, ff. 161-2.
2. WO 47/12, f. 5.
3. WO 51/75, f. 42; WO 51/78, f. 28; WO 51/80, f. 35 & 57; WO 51/81, f. 3.
4. WO 51/27, f. 84; WO 51/34, f. 147; WO 51/37, ff. 180 & 197; WO 49/116, estimate for paving over the vaults dated 10 November 1691.
5. WO 51/92, f. 8; Painter's account *ibid.*, f. 67.
6. WO 47/20A, f. 95.
7. WO 51/94, ff. 32, 55, 111 & 113; WO 51/95, ff. 20-1, 47 & 50.

and Bowyer towers in 1718. One tower, evidently the Flint, was fitted out for 'Lock hardening', the other for 'stocking',[1] tasks which from March 1715 had been ordered to be undertaken solely at the Tower.[2]

(iv) MISCELLANEA

In addition to the activities described in the preceding chapters the Ordnance continued to be concerned with maintaining the all-important water supply of the fortress.[3] By 1661, and until 1675, the post of Waterworker at the Tower was held by William Watson who received £20 *per annum* for his 'Labour & Attentance upon the fforces'.[4] Subsequently the position was occupied for more than twenty years by Thomas Watford who, in 1688, was allowed an additional £5 *per annum* following recommendations made in a report to the Master-General.[5]

In 1663 the Office carpenter repaired the waterworks and supplied one hundred and sixty 'coggs for the Wheel' while the founder provided four new handles.[6] By the end of 1675, however, the Board decided that a new machine was needed, and on 18 November a contract was ordered to be drawn up with the engineer Isaac Thompson.[7] Six days later the Office plumber, John Wise, was instructed to recast all the associated lead pipework.[8] In his bill, dated 6 October 1676, Thompson was paid £42 for the 'Water Engine by him made & provided of brasse & iron for raisinge the Water into the Cistene above in the Tower' with, it was claimed, `the strength of one made aboute twoe tuns of water in an howre'. The account goes on to record that 'the diametre of the fforces of the engine is 3 inches and a halfe with 3 brasse valves, with double Bridges, 4 leaden flyes on

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1. WO 51/102, ff. 73 & 93; WO 51/103, f. 108.
2. WO 47/20A, f. 82, for the Board's directive of 15 March.
3. For the earliest surviving survey of the distribution dated 1760, WORKS 31/203.
4. WO 51/3, f. 103; WO 51/16, f. 71.
5. WO 51/45, f. 152.
6. Barter (1978), p. 114; WO 51/3, f. 183.
7. WO 47/19B, f. 97. For the articles of agreement drawn up with Thompson the same day, see WO 49/111.
8. WO 47/19B, f. 98. Payment for this work is found in WO 51/19, f. 19.

each syde the Crank all fixed to a wooden Stoole with twoe handles'.[1] The number of tanks on top of the White Tower at this time is difficult to determine, but in December 1675 Valentine Bayley was paid for painting the royal initials and dates on five cisterns 'round the White Tower'.[2]

Further alterations to the water supply were authorised in 1683. In February the Board ordered three cisterns to be supplied for use on top of the White Tower. Two, described as 7ft long, 4ft wide and 4ft deep, were positioned in the south-west and north-west turrets. The third, an old reconditioned tank measuring 6ft square and 6ft deep, was installed in the south-east turret.[3] During the following month a warrant was issued to the plumber to provide a new 12in pipe for the waterhouse some 50ft in length[4] and in July two more cisterns for use on top of the White Tower were commissioned. These were 9ft 6in long, 4ft wide and 5ft 6in deep. They were placed against one of the parapet walls which had to be cut back to receive them.[5] In October 1686 two large sluices at Traitors' Gate are recorded as being largely rebuilt by the mason.[6] These openings provided the means by which the water flow to the mill was controlled and their vestiges can still be seen in the east and west flank walls of St Thomas's Tower. Water was not the only means of driving the engine, a tread mill worked by horses was also employed by the end of the seventeenth century. This was ordered to be repaired in January 1696,[7] but it is not clear when it was installed.

There are indications of subsidiary waterworks elsewhere in the Tower at this time. On 4 June 1692, Henry Dixon, millwright, was contracted to make an engine for the sum of £42 to help supply the garrison with water. The device consisted of 'a Great Wheele &

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1. WO 51/19, f. 40; Thompson was required to maintain the engine for one year. For the plumber's bills, *ibid.*, ff. 91 & 195.
2. WO 51/18, f. 115.
3. WO 47/13, f. 21; WO 51/27, ff. 104; WO 51/28, f. 108. For brick seatings installed beneath the tanks, see WO 51/27, f. 130.
4. WO 47/13, f. 65 and f. 82 for a subsequent report stating that the pipe was too short.
5. *Ibid.*, f. 138; WO 51/28, ff. 98 & 104.
6. WO 51/33, f. 81.
7. WO 47/18, f. 105, carpenter's warrant to repair 'the Planks in the Horse Walk that works the Engine that draws up the Water'.

Waller head, 3 Forces, steerpost with Carriages for the Cranks and all other things'.[1] It was evidently worked by a horse and though its position is not recorded, it might be suggested that it was intended for the principal soldiers' accommodation, the Irish Barracks, in the Outer Ward (see Fig. 48 below).

In 1715 another water engine was ordered for the mill by Traitors' Gate to 'raise water from Low water in the Thames to the Cistern proposed to be made on the top of the White Tower' at an estimated cost of £314.10s.08d.[2] The final bill came to £348.15s.07d and included not only a new engine with four cranks, a wheel and frame, but also new 'Horsework', together with 120 yards of 6in elm pipe laid from the engine to the low water mark of the Thames and another 130 yards of 4in elm pipe laid from the waterworks to the base of the White Tower.[3] A detailed drawing of the water engine, showing further proposed alterations, was prepared by Lemprière in 1721 (see Fig. 38 below). The bills for the new cistern on the White Tower were settled with the carpenter in December 1716 and the plumber in June 1717.[4] The great new cistern, which evidently replaced many of the existing smaller ones, was positioned against the north parapet and extended the full distance between the two turrets. A mid-eighteenth-century survey of the White Tower shows the arrangement in some detail, and notes that when filled the cistern contained no less than 9215 gallons.[5] Shortly after the new engine had been installed the pipe from the waterworks to the river was extended so that it could 'reach the Channel' while buoys were positioned near Traitors' Bridge to deter ships from mooring too close to it.[6] Between October and November 1722 a new lead-lined cistern was installed in the waterworks at Traitors' Gate.[7]

Besides the waterworks beneath St Thomas's Tower, the Ordnance repaired and maintained an 'Apron' that extended through Traitors' Gate and beneath the Traitors'

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1. WO 51/46, f. 93.
2. WO 47/20A, f. 117.
3. WO 51/102, f. 48.
4. WO 51/99, f. 21; WO 51/100, pp. 120 & 123.
5. WORKS 31/103, plan dated 1752.
6. WO 47/31, p. 293.
7. WO 51/112, f. 106.

Bridge in the Wharf immediately to the south. Originally installed in 1634-5,[1] this was a timber-framed structure, packed with rubble, intended to prevent vessels from becoming stuck in the mud at low tide. It was repaired towards the end of 1707 after the Office scavelman was instructed to provide a quantity of tempered clay to ram under the structure which was described as having 'blown up'.[2] The damage might, in part, have been caused by works that were carried out to Traitors' Bridge between October 1707 and March 1708. The carpenter's bills, which accounted for nearly £500, included payments for sleeper beams and piles in the foundations, thus indicating that at least part, if not all, the bridge was reconstructed.[3]

The Wharf itself was another part of the fortress for which the Ordnance was largely responsible. The line of the embankment had not been altered since the late fourteenth century, but repairs to its structure were periodically carried out, as happened in 1691 when part of the riverside facing was renewed with Kentish ragstone ashlar while the carpenter replaced timberwork and installed new oak fenders.[4] In April 1662 Sir William Compton instructed the Ordnance officers to ensure that a suitable place was levelled and planked to provide facilities for the increased number of vessels that were engaged in moving Ordnance stores to and from the Wharf.[5] Two years later the Office carpenter was contracted to build a new crane[6] and the three machines regularly recorded for repairs in the Ordnance accounts thereafter are named as the Upper, Middle and Pauls cranes in a bill of 1684[7] and clearly illustrated in the survey of 1682 (see Fig. 49 below).

In 1706 modifications were made to a narrow inlet known as Tower Dock at the western extremity of the Wharf (see Fig. 49 below) whose origins seem to have been associated

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1. Colvin, ed. (1975), p. 276. For a view of the remains of the structure as excavated in 1974, see Parnell (1993), Plate 43.
2. WO 47/25, f. 175.
3. WO 51/75, f. 81.
4. WO 51/44, ff. 123 & 175.
5. PRO 30 37/14.
6. PRO 30 37/9, f. 27. WO 47/5, f. 93, for the Board's order of 6 February 1664 to clear the site.
7. WO 51/28, ff. 198-9.

with the southern arm of a defensive ditch about the late fifteenth-century Bulwark.[1] In March the Board ordered the surrounding breast wall of the dock to be repaired and the northern end of the inlet 'between Thames Street and Tower Hill' to be infilled and a drain installed to carry away standing water.[2] Contracts with the builders were drawn up in May and June[3] and the principal accounts with the mason and carpenter were settled in September 1708.[4] Further to the east, the 'Queen's Stairs' [i.e. Privy Stairs], opposite the Byward Barbican, also attracted attention at this time. The Board called for an estimate of repairs in March 1706 and in June the following year a warrant was issued for the mason to supply new Purbeck marble to replace the steps;[5] the final bills, however, suggest that in the event the whole staircase was reconstructed.[6]

The Office Barge and Shallop For the years 1642, 1644 and 1649 there are accounts for repairs to a barge, used by the officers of the Ordnance, moored at Chatham.[7] It is possible that this was the forerunner of a barge which by the middle of the reign of Charles II was kept opposite the Tower to enable the Master-General and other principal officers of the Ordnance to undertake visits of inspection and attend ceremonial functions. In addition the officers had at their disposal a larger shallop [sloop] which in the years immediately after the Restoration is invariably referred to in the accounts as a smack.[8]

On 15 July 1664 it was decided to replace the barge and an order was therefore placed with a certain Henry ffortee for a new vessel '38 feet in length from head to stern ... & 6 feet & ½ broad in the Midships with a house in the said Barge 7 foot in length'. All this was to be made of good oak for which, together with six oars, a contract price of £40 was agreed.[9] For £32.16s.07d Thomas Bayley painted the main body of the vessel timber

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1. B.L., Harley MS. 5913, f. 15.
2. WO 47/23, p. 186.
3. *Ibid.*, pp. 311 & 389-90.
4. WO 51/74, f. 71; WO 51/75, f. 37.
5. WO 47/23, p. 186; WO 47/24, p. 497.
6. WO 51/77, f. 50; WO 51/79, f. 57.
7. WO 49/80, ff. 5 & 27; WO 49/84, f. 111.
8. *Cf.* WO 51/9. f. 152, quarterly payment of £12.10s.00d to Henry Morris for maintaining the vessel.
9. WO 51/4, f. 44.

colour and painted and gilded one shield and arms on the stern and another great coat of arms in the cabin. He also painted fifty-three panels with trophies and gold edgings and gilded mouldings.[1] The upholsterer John Young fitted the interior of the cabin with rush matting, provided window curtains, cushions for the seats and embroidered a cloth with the arms of the office.[2]

On 30 September 1673 the Board's Journal records that the boat builder John Graves was awarded £43 for delivering a new shallop.[3] His actual bill provides no further information about the nature of the craft, merely noting that it came with a set of oars 'and all things compleate'.[4] New main and fore sails were ordered for the vessel in July 1675[5] and in July the following year a warrant for a new awning was issued, which in the bill is described as being made of velvet coloured cloth.[6] At their meeting on 30 September 1673 the Board also issued Graves with an order to build a new barge. The reason why the one built and supplied only nine years earlier needed replacing is not given, but that it was in a poor condition is evidenced by the fact that from June 1674 to September 1675 the barge master was obliged to hire a small six-oared vessel.[7] Ten months after the order for the new boat had been placed, and with no sign of it being delivered, the Board called for an estimate to repair the old barge.[8] On 23 May 1676, however, the Journal records that the new one was finally ready for fitting out. The Office painter was ordered to paint and gild the craft while the upholsterer had another warrant to supply a new barge cloth and to furnish the cabin using what ever cushions, curtains and others furnishings he could salvage from the old one. All this was evidently to be put in hand before the Master-General attended the next Board meeting, when it was ordered that the new barge should be brought to the King's Stairs against Tower Wharf.[9] The delay in building and delivering the replacement barge might, in part, have been

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1. WO 51/4, f. 107.
2. *Ibid.*, f. 78.
3. WO 47/19B, f. 19.
4. WO 51/17, f. 14.
5. WO 47/19B, f. 85. For the bill see WO 51/18, f. 57.
6. *Ibid.*, f. 88.
7. WO 51/17, f. 221; WO 51/18, f. 54.
8. WO 47/19B, f. 85.
9. *Ibid.*, f. 111.

linked to a dispute over price, for although the total cost of work came to £76.09s.00d, Graves was only awarded £65.[1] The former figure comprised £43 for the main body of the vessel, £15 for joiner's work, £8.10s.00d for carver's work, £5.11s.00d for smith's work and £4.08s.00d for eight oars. The painter, Valentine Bayley, received £30.07s.02d for colouring the body of the craft 'light Wainscott Colour', gilding the carvings, painting and gilding the Master-General's arms on the stern and gilding mouldings inside and outside the cabin.[2] Finally, the upholsterer, John Young, received £19.13s.11d for a green embroidered barge cloth lined, fringed and tasselled.[3]

In October 1673 the Office carpenter was paid for 'fitting a Barge house for the Master of the Ordnance',[4] a task that probably relates to the signing of a contract three months later for renting a building to accommodate the Office barge and shallop near Horsey Down Stairs, opposite the Tower of London.[5] This might have been intended as a temporary measure, for on 27 January 1676 the Board decided that the proceeds from a sale of building materials at the Tower should go towards the cost of constructing a new barge house upon Tower Wharf itself.[6] There is no evidence, however, that the plan was implemented and when in July 1680 the barge house at Horsey Down Stairs was evacuated after being described as 'ready to fall', the Board leased another property from John Graves which stood 'neare the Falcon at the Banckside' farther up the river.[7] This too proved to be a temporary solution for in May the following year it was decided to rent another property close by from a certain Josiah Coteman. This was described as 80ft broad and 12ft broad and cost the Office £12 *per annum* as opposed to the £14 charged by Graves.[8]

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1. WO 51/19, f. 61.
2. WO 51/18, f. 219.
3. WO 51/19, f. 48.
4. WO 51/17, f. 53. For this work William Corzen received £16.06s.09d.
5. WO 51/19, f. 32.
6. WO 47/19B, f. 101.
7. WO 47/9, f. 77; WO 51/23, f. 176. *Ibid.*, f. 17, for a payment to the Barge Master and six fellow watermen for removing the barge and shallop, together with other equipment, to the new building. At the same time Graves carried out repairs to both vessels, *ibid.*, f. 79.
8. WO 47/ 9, f. 140; WO 47/10, f. 49. At the same time Graves was instructed to carry out some repairs to the barge and shallop, WO 51/24, f. 15, for his payment.

Accounts settled with the barge master, John Shuter, during the 1670s, show the barge and shallop being used once or twice, sometimes three times, a month.[1] Generally speaking, the shallop, which was crewed by eleven men (as opposed to the barge's nine) and the master, was preferred if the journey took more than a day. There were, however, exceptions, such as a five day trip to Erith to attend the embarkation of the Prince of Orange for Holland on 15 November 1677. Events like this suggest that of the two vessels the barge was considered the more prestigious.

In November 1682 an account with the master painter records the shallop being new painted `the same Colour as she was formerly' with the crest of the new Master-General, Lord Dartmouth, decorated on the stern and the Office arms on the 'back=board'.[2] A second bill for redecorating 'Lord Dartmouths Shallope' in May 1688 suggests something of the sumptuousness of the vessel, with mouldings and other figurative work regilded and shadowed, the shield on the stern and the mouldings 'around the seats in the state Roome' regilded, the office arms repainted and ten oars and four poles painted in a rich red colour.[3] The last reference to the shallop during the period presently under discussion concerns the provision in 1717 of new fabric for an awning and cushions and the repainting of the vessel during the following year and again in 1722 when vermilion and chocolate colours are mentioned.[4]

In June 1704 a certain Mary Hunter was paid £33.07s.00d for making a new embroidered barge cloth of blue fabric with fringes and tassels and in September the following year Richard Campfield received £14.10s.04d for a set of carpets and curtains to match.[5] The barge was again ordered to be repaired in March 1707,[6] but three months later the Board agreed terms for the building of a new craft with the shipwright John Loftus.[7] Costing

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1. WO 51/20 ff. 105 & 174, covering the period July 1674 till July 1678.
2. WO 51/26, f. 98.
3. WO 51/36, f. 186.
4. WO 51/99, f. 4; WO 51/101, f. 80; WO 51/111, f. 93.
5. WO 51/67, f. 110; WO 51/70, f. 51.
6. WO 47/24, p. 361.
7. *Ibid.*, p. 483, order dated 9 June 1707. The bills are found in WO 51/73, f. 71 & WO 51/75, f. 13. A warrant to glaze the new barge in March 1708 refers to reglazing the old one (WO 47/25, p. 375) thus indicating that the old vessel had found new employment.

over £400 to construct and equip this was to be the largest, most expensive and most sumptuous barge ordered by the Ordnance to date and it was to be maintained by the Office until the department was abolished in 1855. The new vessel was to be 45ft from 'stern to stern posts', 6ft 1in wide and 2ft 2in deep, or thereabouts. Together with a set of oars it was to be built and delivered within a period of six weeks of the contract being signed at a cost of £60.[1] The carpenter William Ogborne made the cabin with its wainscoting, table and lockers and fixed the tail and gang boards for £113.16s.00d while the carver William Wade provided carvings to embellish the vessel to the value of £101.10s.00d.[2] These included a cornice for the cabin, fourteen capitals over the windows with eight badges of trophies to go beneath them and four to be positioned above and below the doorways. Festoons of trophies were cut for ten pilasters and another eight for the front of the barge 6ft in length. Two tail boards, 14ft long, bearing the arms of the Duke of Marlborough, were provided as were two waist boards also carrying the arms of the Duke together 'with an historicall representation of warr & peace contyaining many figures'. Among other carvings provided were supporters bearing the arms of the Queen and the Duke and four badges decorated with classical equestrian figures with `landskips & other figures' in the background that were fastened somewhere at the front of the vessel. The master painter, Henry Howell, painted the vessel with 93 yards of vermilion and 20 yards of olive colour and applied an unspecified quantity of gold leaf to the carvings.[3] Finally, with regards to the soft furnishings and other accessories, Mrs Hunt provided an embroidered 'tilt' or awning of blue cloth with blue and yellow silk fringes valued at £72, while the upholsterer James Milner produced nine blue velvet cushions trimmed with gold arras, nine blue serge cases, ten gold and blue sash strings and an oil cloth to cover the vessel. He also supplied two carpets of blue damask to the value of just over £37, one to cover the cabin floor the other for a table placed in the cabin.[4]

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1. WO 47/24, pp. 361 & 483. The bill is found in WO 51/75, f. 26.
2. WO 51/78, f. 92; WO 51/83, f. 33; WO 51/84, f. 8.
3. WO 51/81, f. 104. WO 47/25, p. 66, for the Board's order.
4. WO 51/77, f. 16; WO 51/81, f. 103; WO 51/82, f. 5. William Ogborne also provided a wooden chest to hold the awning and cushions, WO 51/84, f. 5.

In June 1722 an account was settled for redecorating the barge. The bill indicates that sections of the vessel were again painted vermilion and olive and notes that part of the floor was painted chocolate colour. It also records that no less than £77 was spent on gold leaf.[1] The following year a new embroidered covering for the barge was purchased at a cost of £45.[2]

There are no certain illustrations of the Master-General's barge, but it appears to have conformed to standard designs found in eighteenth-century manuals (see Fig. 39 below). The vessel was eventually broken up in 1859, but some of the ornate oak carvings were salvaged and have survived in the collections of the Royal Armouries at the Tower of London (see Fig. 40 below) together with the coffered underside of the cabin roof. The carved vestiges include parts of the of the cabin cornice and what appears to be glazed top panel of one of the cabin doors. Sections of the two waist boards that were probably located at the base of the cabin also survive. These are the most intricate of the carvings and show the arms of the first Duke of Marborough amidst allegorical figures and depictions of the splitting of the terrestrial globe. Besides these are the lion and the unicorn that supported the royal arms and two panels depicting classical warriors in mounted combat. The largest single carved piece is a shield bearing the arms of the Board of Ordnance supported by a merman and a mermaid against a background of banners and trophies. The carver's account lists such a shield made for the stern of the vessel, but with the figures of Mars and Pallas [i.e. Athena] rather than that of a merman and a mermaid. The discrepancy might be explained if the surviving shield is a later replacement[3] or if the carvings were not executed exactly as set down in the bill.[4]

The Line of Kings This, as the name suggests, was a line of figures representing the kings of England. They appeared on wooden horses, featuring carved wooden heads and wearing what was claimed to be their personal possessions (see Fig. 41 below). The

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1. WO 51/111, f. 93.
2. WO 51/112, f. 79.
3. In June 1735 repairs were ordered to be carried out to the supporters and the frieze and capitals 'round the barge' while a new supporter in the form of a unicorn was commissioned, see WO 51/135, f. 123.
4. The account lists alterations to some of the other carvings.

exact circumstances under which the Line came to be at the Tower is not known. In the earliest inventory of the figures, which was drawn up in October 1660 and at a time when the Line was the responsibility of the Armoury, they are described as 'standing formerly at Greenwich in the Green Gallery'.[1] Presumably, therefore, they represent the ten wooden horses 'with Statues of men mounted upon them' which were at Greenwich in April 1650[2] and which in turn may have included some or all of a group of eight wooden figures that are first recorded at Greenwich in the 1547 Inventory of Henry VIII.[3]

The 1660 inventory lists ten suits of armour, each upon 'a horse Statue of Wood' with saddles and other furniture. These are attributed to:

Prince Henry
Henry VIII
Henry VII
Edward III
Charles I
Edward IV
Henry VI
Earl of Leicester
Charles Brandon (Duke of Suffolk)
William the Conqueror

The inclusion of Charles I is significant. It is highly unlikely that the executed monarch would have been represented at the Tower during the Commonwealth and this may indicate that the display had but recently been established there. Perhaps the visit of Charles II to the castle on 4 August 1660,[4] doubtless a highly symbolic occasion after so many years in exile, provided the impetus for setting up what may be called the proto-Line of 1660 at the Tower.

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1. R.A., Dartmouth Loan MS.
2. Reid (1966), p. 340.
3. Borg (1976), pp. 318-9.
4. Latham & Matthews, eds. (1970-83), Vol. I, p. 214.

On 15 August 1661, the Dutch artist William Schellinks visited the Tower and in the armoury saw the Line in a long room arranged behind a rail.[1] His description of the row of figures, according to the keeper who escorted him around, follows the order set down in the 1660 inventory, though between Henry VI and Charles Brandon he records a representation of the Duke of Gloucester, almost certainly a mistake for the Earl of Leicester. Schellinks regarded the body armour of the kings and their horses' armour as 'very ancient and uncommon ... but all well looked after and polished'. Importantly, he also notes that in a nearby room he could see the Tower chapel through a window, thus helping to place the display somewhere in the old Tudor Long House of Ordnance on the hill north of the White Tower.[2] This is doubtless the same location as the 'Horse Armoury' first mentioned in the Ordnance accounts in 1672, two years after the Office assumed responsibility for the Line from the Armoury department.[3]

Subsequent Ordnance inventories taken in 1675, 1676, 1679 and 1681 record the same figures as listed in 1660.[4] A payment of £8.14s.07d made to the carpenter Thomas Case in June 1669 for making a new horse and another to Thomas Bayley for painting it,[5] possibly represents the Ordnance replacing one of the horses, rather than providing an addition, a few months in advance of the organisation taking over formal control of the Line from the Armoury department.

A survey of the Line taken in 1682, lists the figures of Charles I and Prince Henry as being at Windsor Castle.[6] These had presumably been removed from the Tower the previous year after an order of the Board dated 28 July called for one of the Tower horses and two of the accompanying suits of armour to be sent down to Windsor to help decorate

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1. Exwood & Lehmann, eds. (1993), pp. 48-50.
2. Alan Borg incorrectly interpreted a subheading in the 1660 inventory as evidence for the Line at that time being in the Queen's House, Borg (1976), p. 318.
3. WO 51/15, f. 196; payment of £82.02s.06d to Francis Audley, Arthur Nicholson and John Hicks for cleaning and oiling the arms in the Horse Armoury from 24 July 1672 to 24 July 1673.
4. WO 55/1708, ff. 32-3; WO 55/1709, ff. 87-8; WO 55/1710, ff. 90-1; WO 55/1713, ff. 90-1; WO 55/1720, ff. 77-8.
5. WO 51/10, f. 70; WO 51/12, f. 37.
6. WO 55/1721, ff. 81-2.

the King's Guard Chamber and St George's Hall.[1] A bill settled with the Ordnance storekeeper at the castle in April that year for the painting of a wooden horse[2] presumably indicates why the figure of Prince Henry was delivered on its own. The representations of Charles and Henry rejoined the display at the Tower following the death of Charles II.[3]

In May 1683 the painter, Valentine Bayley, was paid £11 for painting the sculptured components of the Line. The horses of William the Conqueror and Edward IV were both decorated 'pyde' colour, Edward III's a dapple grey, Henry V's (presumably a mistake for Henry VI's) grey, Henry VII's and Charles Brandon's, chestnut, Henry VIII's, white, Robert Dudley's (i.e. Earl of Leicester's) black and Charles I's a drum colour. The armour of two horses was painted as were five of the 'Kings faces according to nature and the furniture of their heads painted & gilded'.[4] The latter represents the earliest reference that has been found to carved heads, though there is no reason to supposed that they did not form part of the Line in 1660.[5]

On 4 June 1685, the Board ordered George Frankline, Deputy Keeper of the Armoury, to find a suitable craftsman to make the statue of a horse to receive the armour of the late King Charles II.[6] Two weeks later the carver Grinling Gibbons was duly contracted to provide a wooden horse, together with the carving of the late 'kings face to be placed in the said armour' for the sum of £40.[7] In late November that year warrants were issued

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1. WO 47/10, ff. 50 & 69.

2. WO 51/23, f. 66. There is further evidence for the presence of wooden horses at the castle in the form of an order from the Board dated 19 December 1685 requesting Grinling Gibbons to present a 'Draught of a Horse &c for a George (presumably St George)... & an Estimate of the charge of carving the same', WO 47/16, f. 82. Subsequently, in January 1688, the Ordnance storekeeper at the castle paid for the mending of 'the Wooden horse per order of the Officers of the guard', WO 51/37, f. 119.

3. Both are listed in a Tower inventory of 1687, see B.L., Harley MS. 7458, f. 13.

4. WO 51/27, f. 61.

5. It is worth recalling that neither the inventories taken before or after this date specifically mention the heads.

6. WO 47/15, f. 10.

7. *Ibid.*, f. 38.

for painting the horse and face and for supplying a saddle, bridle and other fittings.[1] By the end of the following month Gibbons had delivered and installed the horse in the Armoury while Valentine Bayley was paid £6.17s.00d for painting the face of Charles II, gilding and burnishing a truncheon for the king to hold and painting the horse bright bay.[2] In addition, Edward White received £10 for providing a saddle and bridle, holsters, breastplate and crupper covered with crimson velvet and fringed with lace.[3] Both Gibbons's horse and face can still be found at the Tower (see Figs. 42 & 45 below).

Gibbons, Bayley and White were to collaborate again on a figure and horse that represented the return of Charles I to the Line.[4] The warrants for Bayley and White's work were issued on 15 July 1686; by comparison Gibbons's did not appear until the following January. It is possible the delay was caused by an initial intention to reuse the horse that formerly carried the figure of Prince Henry and which is listed in four inventories prepared between 1682 and 1685.[5] In any event, Gibbons promptly provided a new horse and his bill, which together with Bayley's and White's, was settled on 28 January 1687.[6] For making the horse and carving Charles I's face, Gibbons again received £40. Bayley was paid £6.17s.00d for painting the horse a light drum colour, for painting the king's face and for burnishing and gilding a truncheon. In addition he received £1.05s.00d for painting the face of Henry VI, which presumably formed part of the existing collection, since no mention is made of carving a new head at this time. White's bill of £14 was for a large saddle furnished with bridle, holsters, breastplate and crupper covered with blue velvet and fringed with lace, and for a pair of wooden pistol stocks with cases. Again, the horse[7] and head (see Fig. 43 below) produced by Gibbons can still be seen in the remnants of the Line at the Tower. In addition, there is a second head which strongly resembles the appearance of Charles I, but which unlike Gibbons's

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1. WO 47/16, f. 57.
2. WO 51/31, ff. 142-3.
3. *Ibid.*, f. 153.
4. The order to return the armour of Charles I to the Tower was issued by the Board on 6 November 1685 and reaffirmed on 19 December following, WO 47/16, ff. 35 & 83.
5. R.A., Dartmouth Loan MS; WO 55/1729, ff. 28-9; WO 55/1731, ff. 25-6.
6. WO 51/33, ff. 187, 190 & 199.
7. R.A. Inv. No. XVII.18.

work features long flowing hair and was never intended to fit within a helmet (see Fig. 44 below). It is possible that this represents the only surviving original carved head.

The decision, in March 1688, to begin construction of the Grand Storehouse (see p. 65 above) coincides with the start of an important chapter in the evolution of the Line of Kings. The need to relocate the Horse Armoury in advance of building work seems, in fact, to have been directly linked to a decision to enlarge the Line and thus create a major display that was to delight visitors to the Tower until the late nineteenth century when the collection was finally dismantled.[1] Unfortunately the Board's Minute Books for the late 1680s do not survive so that the reasons for enlarging the Line are not documented. The chain of events, however, can be followed. On 26 May 1688, Thomas Case, the Office carpenter, was paid for twenty-nine days work in taking down the horses and placing them in the 'Scotch Storehouse'.[2] A plan of 1721 places the Scotch Storehouse in the White Tower (see **LXIII**, p. 174 below). In 1708, however, the Horse Armoury is described as being 'a little E[astwar]d from the Office of Ordnance'.[3] This presumably refers to the New Armouries Building, where a survey of 1717 shows it on the first floor (see Fig. 6 below) and where it was to remain until 1826 when the collection was moved to new accommodation in a building against the south side of the White Tower.[4] Ned Ward in his visit to the Tower in 1700 tells how, having peered into the basement of the White Tower and inspected the Small Armoury in the Grand Storehouse, he proceeded to view the Horse Armoury in the company of a guide.[5] He does not identify the location of the Armoury, but it was clearly not in the White Tower. More important, however, is some information contained in a letter from George Follett to his friend Robert Harley concerning an incident that occurred on 8 September 1692 when London was shaken by an earth tremor. Follett writes:

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1. Borg (1976), pp. 323-4.
2. WO 51/36, f. 85.
3. Hatton (1708), p. 635.
4. Borg *op. cit.* p. 323.
5. Ward (1704), pp. 233-5.

'amongst the effects of the late earthquake one was something comical. You remember the large new store house at the Tower and there above the stairs all the heroes and their horses are set forth in armour. Suffering such a shock it was great prowess in them to stand their ground; but the mortals themselves conceiving by the clashing of their armour that they were upon the march, gave instances of the two extremes of motion'.[1]

It is clear, therefore, that by September 1692 the Line of Kings had been established in the New Armouries Building. In fact, there is no reason to suppose that it was not moved there in 1688, presumably at the expense of the Scotch Storehouse which was re-established in the White Tower. In this respect it is interesting to note that at the time that Thomas Case was paid for moving the horses he received an additional £334 for substantial repairs and alterations to the ground floor of the New Armouries Building, which might have been part of some wider works brought about by the introduction of the Line.[2]

Shortly after the move a series of warrants was issued between May and August which resulted in seventeen new horses being commissioned from some of the leading wood carvers of the day. The new sculpture began to appear at the Tower quite promptly, thus in September 1688 John Nost received £20 for a horse and William Morgan £20 for a horse and a carved head.[3] In December, Thomas Quillians was paid £20 for a horse and head, as was William Emett in February the following year.[4] In March 1689 William Morgan received £120 for another six horses and six heads and Marmaduke Townson £40 for two horses and two heads.[5] Finally, in March 1690, John Nost was paid £100 for a further five horse statues and heads, together with five truncheons or sceptres.[6] It seems likely, however, that the delivery of some of the sculpture was delayed for a Tower inventory dated 1 January 1691 lists only twelve wooden horses and twelve 'Statues of

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1. Borg (1978), p. 71.
2. WO 51/36, f. 83. The floor was replaced again in 1719, WO 51/104, f. 2.
3. WO 51/37, ff. 38 & 46.
4. *Ibid.*, f. 166; WO 51/38, f. 24.
5. *Ibid.*, ff. 20 & 45.
6. WO 51/40, f. 122.

Wood whereon a face is Carved'.[1] In a second survey taken exactly two years later, all the new carvings seem to be accounted for, with nineteen pairs of horses and heads listed.[2] The figure may comprise the seventeen new commissions, together with the sculptured parts of Charles I and Charles II which, as already stated, survived to this day. Assuming, as seems likely, that most of the earlier carvings were replaced at this time, the number of new horses exceeds the number of kings that are known to have existed (see below), so that it must be presumed that some were intended for non-royal figures. Unfortunately none of the bills indicate the names of the various figures whom the carvings were intended to represent, though the inclusion of the sceptres in Nost's second bill indicate that at least five were royal.

Further activity in the Horse Armoury towards the end of 1692 is indicated by an order of the Board dated 15 October to supply five hundred pairs of leather girdles, three dressed hides and eleven thousand nails of various sizes,[3] but the final addition to the Line during the period presently under discussion, was that of William III, introduced in 1702. The author of the king's head was Nicholas Allcock who received £2 for his work.[4] The storekeeper of the Armoury, William Nicolas, received a total of £21.18s.06d for 'setting up an Armour ... to present the Late King William of Ever Glourious Memory'.[5] The trappings were of green velvet embroidered with gold, parts of which still survive, as do a pair of wooden dummy pistols in leather holsters.[6] Nicolas's account also covered the cost of the saddle, a sword and the painting of the king's face.

In 1708, Hatton states that there were fifteen figures of kings in the Line,[7] a number verified by one of the first guidebooks of the Tower published in 1753 which, including the representation of George I ordered in 1749,[8] lists sixteen.[9] This number comprises

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1. B.L., Harley MS. 7662, f. 12.
2. *Ibid.*, 7463, p. 22. A horse and head were valued at £20.
3. WO 55/1656, entry dated 3 November 1694.
4. WO 51/66, f. 2. The head can still be seen at the Tower, R.A., Inv. No. XVII.45.
5. WO 51/64, f. 117.
6. R. A., Inv. Nos. XVI.1-4.
7. Hatton (1708), p. 635.
8. WO 47/35, pp. 83-4.
9. Newbury (1753), pp. 51-8.

the seven kings recorded in 1660 (including the 1686-7 replacement of Charles I), together with those of Charles II and William II added in 1685 and 1702. The other six must belong to the series of sculptures commissioned in 1688. Their identities can be ascertained from the 1753 description. They are:

Edward I
Edward VI
Edward V
Henry IV
Henry V
James I

Finally, it is worth recording that items from the Horse Armoury were occasionally required for ceremonial functions outside the Tower. The most important of these concerned the issuing of armour to the King's Champion to be worn at the Coronation. The first issue to be made after the Ordnance assumed the responsibilities of the Armoury department in 1670 was connected with the coronation of James II on St George's Day 1685. Sir Charles Dymoke, whose family had held the hereditary title of King's Champion since medieval times,[1] was supplied with a rich suit of armour attributed to Edward III, which the well known armourer Richard Holden cleaned and repaired in advance for the sum of £20.[2] The Deputy Storekeeper of the Armoury, George Francklyn, procured additional items, including a gilded horseman's sword, a velvet scabbard and had the arms of the Champion painted on a shield.[3] Dymoke's claim to the armour, as part of the traditional fee, was refused, presumably on the grounds that it was of historic importance, and the Storekeeper noted in the Armoury Issue Book that the suit was after 'the Service of the Day ... returned in again'.[4] It was conceded, however, that the Champion should receive an armour by royal warrant dated 15 May 1685 and an Ordnance bill dated 18 May records that a cap-a-pe gilt armour was purchased from

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1. Banks (1817).
2. WO 51/30, f. 28.
3. *Ibid.*, f. 29.
4. WO 55/1656, entry dated 19 May 1685.

Charles Beaumont, the then Ordnance Keeper of Small Guns, and duly delivered to Sir Charles Dymoke with spurs, a lance, shield and 'Gauntlett Main fair' the following day.[1]

For the Coronation of King William and Queen Mary on 11 April 1689, the armour attributed to Edward III was again requisitioned. In addition, Richard Holden cleaned and new lined the suit, refurbished a lance, and provided new items by way of a shield decorated with a star and spike, a gilded gauntlet and a pair of rich pistols.[2] According to a note in the Armoury Issue Book, however, the armour was 'never returned again into the Storehouse but kept for his Fee' by the Champion.[3] As a consequence Sir Charles 'undertook to furnish himself' at the Coronation of Queen Anne in 1702 and was thus allowed £50 by the Ordnance Board instead.[4]

For the Coronation of George I in 1714 Lewis Dymoke was supplied with a suit of armour attributed to Charles II, together with a pair of pistols, a sword and scabbard.[5] In advance of delivery, Henry Holden repaired and refurbished the armour while the painter John Pink gilded, lacquered and painted a large spear and painted the Champion's arms in a 'Gothick Ornament' upon a large iron shield.[6] Once again the question of the Champion retaining the arms and armour was raised, but the Board insisted that the items should be returned to the Tower and the Champion awarded £60 instead.[7] Dymoke returned the armour, but seems to have retained the other items, claiming he purchased the pistols for the Coronation of Queen Anne. In March 1715 the Board ordered the Champion's payment to be withheld until all the loan had been returned, but during the following month this decision was rescinded in order to 'avoid further Trouble'.[8] In addition to furnishing the Champion, the Armoury Storekeeper was ordered to supply the Armourers and Braziers Company with complete armours for horse and man, six suits of

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1. WO 51/30, f. 38; WO 55/1656, entry dated 19 May 1685.
2. WO 51/38, f. 79.
3. Beard (1937), p. 269.
4. WO 51/64, f. 11.
5. WO 47/27, pp. 41 & 76; WO 47/20A, f. 7.
6. WO 47/27, pp. 76 & 105; WO 51/92, ff. 91-2.
7. WO 47/27, pp. 105 & 112; WO 51/92, f. 92.
8. WO 47/28, pp. 70-1 & 105.

foot armour, two gilded shields, a lance and two battle axes so that members of the guild could appear at the 'Publick Entry' of the monarch in Westminster Hall.[1] Prior to this the master and wardens of the company had been supplied with armour, shields and battle axes in June 1706 to attend a service of thanksgiving at St Paul's Cathedral in the wake of Marlborough's military success in Brabant.[2]

It is perhaps fitting that the last entry in the Armoury Issue Book for the period under present discussion was on 22 July 1722 and concerned a suit of gilded armour `to be laid upon the Coffin of the late Duke of Marlbrough'.[3] The Duke, who died on 16 June 1722, was buried with great splendour in Westminster Abbey after a long procession. Throughout the duration of both procession and interment ceremony, guns on Tower Wharf were fired at one minute intervals to honour the late Master-General of the Ordnance.[4]

The Observatory Perhaps the most unlikely, and certainly the most ephemeral, of the institutions established by the late Stuart Ordnance at the Tower, was that of the Observatory. The First Astronomer Royal, John Flamsteed, received his royal warrant on 4 March 1675, and almost immediately took up residence at the Tower with his friend, Sir Jonas Moore, in the Surveyor-General's house close to the Constable Tower (see pp. 99-100 above). Between then, and his departure to Greenwich the following July, Flamsteed carried out observations from the north-east turret of the White Tower;[5] his first recorded observations there were on 18 April. There is no obvious record of expenditure for fitting out the turret, although a single payment to the carpenter for 'fitting a planet pole at Sir Jonas Moore's' may be connected,[6] and it must be assumed, therefore, that the Ordnance merely provided accommodation for Flamsteed to work in, and that the Astronomer Royal used his own instruments.[7]

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1. WO 47/27, p. 39.
2. WO 47/23, p. 384.
3. ffoulkes (1916), p. 55, note 2, identifies this as one of the armours of Charles I.
4. WO 47/20B, f. 118.
5. This is still referred to as 'Flamsteed's Tower'.
6. Barter (1978), p. 112.
7. Howse (1975), pp. 2-3.

IV. LATER HISTORY OF THE ORDNANCE BUILDINGS

(i) BRIEF DESCRIPTION OF DEMOLITIONS

With a few notable exceptions, little of the late Stuart and early Hanoverian Ordnance building legacy can be seen at the Tower today. Much had already disappeared before the demise of the Office in 1855; more was to go during the subsequent 'remedievalisation' of the Tower at the hands of the Office of Works during the second half of the nineteenth century.[1]

The first major casualty was the administration office in Coldharbour. This was demolished to make way for a larger office building after fire gutted the Lanthorn Tower and several adjoining buildings in 1774 - it is worth noting that the fire itself started in the house built against the external angle of the Lanthorn Tower and east curtain wall for the Ordnance clerk, Mr Levin, in 1719 (see pp. 106-7 above).[2] The new office was itself badly damaged by fire only a few years later in 1788 and during the subsequent refurbishment and enlargement of the building, the old medieval great hall and the Ordnance Treasury House to the west were pulled down. To the north, the storehouse erected in 1670-1 against the inner curtain wall survived, albeit in a much altered form, until 1899 when it was replaced by a large gothic building which served as the Tower's main guard.

The buildings about the White Tower fared no better: the 1717 Carriage Storehouse to the south was replaced by a building known as the New Horse Armoury in 1825, while the contemporary main guard to the west was swept away in 1846. The single greatest loss, however, was the Grand Storehouse which together with its fantastic contents was destroyed by fire during the early hours of 1 November 1841.

In the Outer Ward, the Irish Barracks, constructed in 1669-70, was demolished to make way for new soldiers' lodgings in 1752 while the enclave of Ordnance buildings around

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1. For a general account of this programme, Parnell (1993), pp. 88-108.
2. For an account of the fire, *Gentleman's Magazine*, Monday 31 January 1774 and WORKS 31/171 for an Ordnance plan showing the extent of the damage.

the smith's house to the north was swept away during the 1850s as part of a clearance programme recommended by the Engineer's Department.

The Ordnance proof yard at the east end of the Wharf survived in an altered form until the area was cleared of buildings during the 1870s, while Sir Bernard de Gomme's gateway and enclosure at the western entrance was pulled down with the buildings of the menagerie in 1853. Nearby the southern extremity of de Gomme's moat retaining wall was taken down in 1936 as part of an operation to expose and display the remains of the medieval Lion Tower, while that erected along the eastern moat disappeared during the construction of the Tower Bridge approach in the 1890s.

(ii) DESCRIPTION OF SURVIVING FABRIC

White Tower The window openings to the ground and uppermost floors date from 1715-6 (those serving the first floor were introduced to the same pattern in the late eighteenth century), as do the loading door openings in the north front - the lower pair containing their original oak panelled doors and iron hinges. The three windows lighting the eastern ground floor chamber still retain the frames introduced by William Ogborne together with their contemporary iron hinges and fittings. The four weather vanes on the cupolas are those made and installed by Ralph Greatorix and William Partridge in 1669, though the original counter-balances, in the form of outstretched arms holding balls and crosses, were replaced by the existing arrows sometime towards the end of the eighteenth century. Lastly, five large rainwater hopper heads at roof level on the east, west and north fronts are worthy of note as they bear the monogram of Anne and are dated 1707.

New Armouries Building Built in 1663-4 against the rear of the curtain wall between the Salt and Broad Arrow towers, this now stands as the only surviving Ordnance storehouse at the Tower and the oldest Ordnance building to be found anywhere in the country. Half H-shaped in plan, the courtyard between the wings was originally enclosed by a wall and pentice to the west, the line of which is now marked by a low retaining wall. The building has an overall length of 128ft while the main body is some 43ft wide. It comprises two storeys and a double attic below a pitched roof which is, and always has been, covered with plain tile. The roof is of queen post construction and is original,

though some of the principal struts and collar beams have been adjusted in recent years. The walls are composed of red brick laid in a Flemish bond. The two principal floors are divided into nine bays, the pattern of fenestration being original, though sash frames have long since replaced the seventeenth-century casements with most of the openings being enlarged at the same time. The lower attic is pierced by dormer windows at regular intervals, while the upper attic has only one window to the south and one to the north. Most of these windows appear to occupy original openings.

The principal entrance is located in the centre of the west front and has in recent years been embellished with columns and a trophy of arms. The loading doors formerly located on the two floors immediately above were replaced by the extant windows in the 1950s. The doorway on the south side of the north wing occupies an original position, but that in the wing opposite is modern and replaces an original opening now converted into a window immediately to the east. All other external entrances are modern.

Internally the most interesting feature is John Scott's timber frame which incorporates a series of octagonal columns or pillars supporting the first and second floors. Those on the ground floor are the most elaborate and rest on pedestals of Purbeck marble. The columns feature carved bases with decorative stop-chamfers; the ceiling braces spring from imposts and above them are applied mouldings imitating capitals (see Fig. 6 below). Unlike the columns and braces on the ground floor, which are carved in oak, those on the first floor are fashioned in pine; the ceiling braces associated with the first floor columns are modern while those on the second have been removed at some stage.

On the external south face of the building, at ground floor level, are two trophies of arms. The largest was commissioned to adorn the main entrance of the Ordnance office built in the late eighteenth century, the smaller device is earlier and of considerable interest in the present context. It comprises a shield bearing the Ordnance arms of three field cannon and three cannon balls, with cyclops supporters either side wearing Roman armour and carrying hammer and forceps (see Fig. 7 below). Beneath the shield a wreath bears the Ordnance motto SUA TELA TONANT[I] ('thundering his arms') and above is a crest comprising a crown with a hand grasping a thunderbolt. The mannerist style of the

carving and the early appearance of the guns suggest a late seventeenth or early eighteenth-century date, and although the arms have not been identified in any account, it might be supposed that they embellished the late Stuart Ordnance administrative office erected in Coldharbour in 1672-3 (see pp. 37-9 above). The arms were presumably salvaged during demolition of the building in 1777 and placed on the new office. The new building was in turn pulled down in 1883 and the carvings transferred to their present location.

Within the ground floor of the New Armouries Building can be seen the great martial arms carved by John Young in 1691 for the pediment over the main entrance of the Grand Storehouse (see Fig. 12 below). Flanking the royal coat of arms with their unicorn and lion supporters is a splendid array of seventeenth-century ordnance, early muskets, swords, a cuirass and horseman's helmet and a ceremonial shield with the head of Medusa embossed in the centre. The wreath beneath the coat of arms bears the motto of the House of Orange JE MAIN TIEN DRAI ('I shall maintain').

Old Hospital Block A terrace of four houses built for Ordnance clerks in 1718-9 (see pp. 105-6 above). It was subsequently converted into the Tower infirmary during the nineteenth century, hence its name. Originally E-shaped in plan (the northernmost wing having now gone) the main body of the building is 80ft long and 40ft wide. It comprises three storeys and an attic over a vaulted basement which is partly terraced into the slope of the hill. The principal, west, elevation is divided into twelve bays with string courses located between second and third floors and at roof level. The largest windows are found on the first floor. These are set within round-headed openings whereas elsewhere, like the entrance doorways, they carry segmental arches. The architectural composition, therefore, follows the pattern set down in the original draft (see Fig. 35 below).

The northern half of the Tower terrace suffered serious structural damage during an air raid in 1940 and was subsequently taken down and rebuilt. The southern half, however, retains many of its original features, including plastered ceilings with moulded cornices, fireplaces, doors and window frames with linings. The accommodation has now been

divided horizontally into flats and as a consequence two of the former entrances in the west elevation have been converted into windows.

Royal Fusiliers Museum This outwardly mid-nineteenth-century building acted as the former Officers' Block and occupies the site of the two great houses erected for the Surveyor and Clerk of the Ordnance in 1699-1701 (see pp. 103-4 above). When the need for new officers' accommodation was identified in 1845 the intention seems at first to have been to utilise the existing Stuart houses, but to completely rework the exteriors with gothic windows and a variety of embellishments. Two years later, however, the Royal Engineers were producing plans for an entire new building.[1] That said, the plan of the existing building, including some of the internal divisions, follows closely that of the Stuart houses, while early brickwork can be detected at the base of the south wall. It would seem, therefore, that to a considerable extent the plan of the existing building is determined by the earlier Ordnance houses and that in places early masonry is incorporated in the structure.

Martin Tower Within the upper half of the building the mezzanine floor installed by the Ordnance in 1668-9 (see p. 34 above) survives; the raised and fielded panelling in the uppermost northern room is possibly contemporary. In February 1719 the Ordnance Board decided to demolish some outbuildings associated with the Jewel House as they were deemed to be too close to the Grand Storehouse.[2] During the months that followed this operation there was a certain amount of correspondence between the Office of Works, Ordnance and the Treasury about the need for a new access to the upper part of the Martin Tower after the Keeper of the Jewel House, James Brunwell, complained that the existing arrangement was on the point of collapse as a result of the demolitions.[3] A surviving draft in the Treasury papers shows that a new building, comprising a large staircase leading to the upper part of the Martin Tower with a wash and coal house on the ground floor and a bed chamber and closet above, was proposed to be built against the inner face of the tower at an estimated cost of £376 (see **LXI**, p. 173 & Fig. 59 below).

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1. WORKS 31/189.
2. WO 47/32, p. 76, order of the Board dated 24 February.
3. *Cal. Treas. Papers, 1714-19*, p. 470; WORKS 6/7, pp. 80 & 332.

The architectural style of the building, with its plain pilasters and bold cornice, is characteristically 'Ordnance Vanbrugh' (see pp. 149-50 above) and there can be little doubt that the draft was the work of the Ordnance. In the event, however, the scheme was not implemented. Instead the Office of Works built a modest wash-house and kitchen for the Keeper in 1721[1] while the surviving external brick staircase leading to the first floor of the tower was erected by the Ordnance in 1729, with the expense being shared by them and the Office of Works.[2]

Immediately to the west of the Martin Tower, contrived in the thickness of the curtain wall, is a spacious sally port providing access from the Inner Ward down into the Outer Ward. In essence this is the passage that was formed by the Ordnance in 1683 though later repairs and alterations to the brickwork are evident. A smaller, yet better preserved tunnel, formed in the thickness of the inner wall between the Devereux and Flint towers four years later, also survives (see p. 54 above & Fig. 53 below).

Devereux Tower During modernisation of the Warder's lodgings within this building in 1983, evidence for the gun platform installed in 1683 (see p. 54 above) was recorded in the wall faces of the uppermost floor and immediately above the level of the surviving medieval stonework.[3] This comprised ten courses (*c.*4ft) of brickwork supporting a series of timber joists. Above was some 18ins of brick and stone rubble covered with lead which might be regarded as part of the firing step that was formed against the rear of the parapet.

Legges Mount The most obvious evidence for the adaption carried in 1682-3 (see p. 53 above & Fig. 50 below) is the six large gunports at first-floor level facing Tower Hill. Above, the masonry has been refaced in stone during the late nineteenth century, but the back of the bastion, overlooking Mint St, still exhibits its late seventeenth-century brickwork. Internally a number of important features were recorded in 1976 and are now

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1. Colvin, ed. (1976), p. 384.
2. WO 51/126, f. 62. WORKS 31/114 is a draft design of the scheme eventually implemented.
3. English Heritage Plan Room, T.o.L Drawing No. AS 1/1.

preserved, though no longer visible. These include the spine wall constructed to support the two new floors and their gun batteries; the timber framing and boarded surface of the first floor survives and a series of iron ring pins let into the masonry either side of the gun ports at this level to which the guns themselves were tethered.

Develin Tower Within the upper floor can be seen much brickwork which evidently dates from the partial rebuilding of the tower in 1680 (see p. 50 above). Two small rectangular gunports in the north wall at this level are possibly contemporary or were formed three years later (see p. 53 above).

Middle Tower A good deal of the work carried out in 1717-9, when the building functioned as the Ordnance Barrack Master's accommodation, can still be seen. Externally this takes the form of the Portland stone refacing which can easily be identified from the original medieval Caen ashlar and coursed rubble. Over the entrance arch is the royal coat of arms carved by Thomas Green (see p. 105 above). The gate-house retains all the romanesque-style window openings that were formed at this time while many, if not all, still possess contemporary window frames. Even the lead rainwater pipes together with their hopper heads appear to date from this time. Internally the rooms have altered surprisingly little since 1719 with most retaining plain panelling and having plastered ceilings with simple cornices. A splendid, heavily studded, wooden security door controlling entry into the ground floor chamber of the north gate-tower may also date from the early eighteenth century.

The Moat The brick retaining wall along the west and north sides of the moat, albeit much repaired, and in places refaced, is that built under the direction of Sir Bernard de Gomme in 1670-2 (see pp. 45-6 above).

DISCUSSION AND CONCLUSIONS

In 1598 John Stow described the Tower of London as

> 'a Citadell to defend or command the Citie: a royall place for the assemblies, and treaties. A Prison of estate, for the most dangerous offenders: the only place of coynage for all England at this time: the Treasurie of the ornaments and jewels of the crowne, a generall conserver of the most Recordes of the kings courts of justice at Westminster'.[1]

Sixty-two years later, at the Restoration, this statement was still accurate; though the internal distribution of the buildings within the fortress among its institutional occupants had altered. The Office of Ordnance was now in control of the largest part.

It seems clear that in 1660 the Tower storehouses were insufficient to hold the mass of artillery and firearms being reclaimed from the localities. The transfer of areas to the Ordnance therefore resumed in 1663 with the start of building work on the first of the great post-Restoration storehouses in the Wardrobe Garden of the now defunct royal palace. In March 1666 the process of acquisition was greatly accelerated by the Privy Council's decision to enlarge the powder magazine in the White Tower, to provide a direct access to it from the Wharf and to rearrange other military stores round and about. This bold plan was intended to cut the cost of transporting supplies to the Tower and to reduce the time needed to supply the fleet, especially at a time when the navy was battling for control of the North Sea and the English Channel following the outbreak of the Second Dutch War in March 1665. It also offered the significant advantage of not having to convey large amounts of gunpowder through the streets of the City with all the hazards that entailed.

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1. Stow (1908), p. 59.

With so many advantages the abandonment of the new route from the Wharf into Coldharbour, less than three years after it had been formed, is somewhat surprising, as is the apparent lack of justification for the action in any of the surviving official documents. It is possible that the new bridge over the moat and the entrance through the river curtain were judged to be too vulnerable, especially in the wake of the spectacular Dutch raid on the Medway in June 1667. But, that said, it might be supposed that the approach could have been further fortified in preference to redirecting munitions and other supplies to and fro along the Wharf and in and out of the narrow western entrance. In any event the Council's recommendations for landing and proving powder were never fully implemented, the proof yard was never moved on to the Wharf and gunpowder continued to be carted through the streets of London. Presumably the powdermakers or the Ordnance had difficulties in operating the new river route. Moreover, the catastrophic Great Fire in September 1666 must have questioned the logic of having the country's largest magazine in the middle of London. John Evelyn thought that had the flames reached the White Tower the ensuing explosion would not only have 'beaten downe & destroyed all the [London] bridge, but sunke & torne all the vessels in the river, & rendered demolition beyond all expression for severall miles'.[1]

Only in 1667, when there were 9,677 barrels of powder in store, did the White Tower come close to housing the 10,000 barrels or more envisaged by the Council.[2] Thirteen months later this figure had fallen to 7,662 barrels[3] and in November 1677 the Ordnance Board ordered that only 600 barrels should be retained, the rest were to be transferred to Upnor Castle in Kent,[4] which by now had been turned into the largest powder magazine in the kingdom.[5] Having taken the decision, however, the process of dispersal stalled and in November 1678 the Privy Council was instructing the Office to implement the order.[6] In August the following year the Ordnance Board was again calling for 5,000

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1. de Beer (1955), p. 458.
2. WO 49/110, survey dated 14 June.
3. *Ibid.*, survey dated *ultimo* July 1668.
4. WO 55/391, f. 153.
5. Tomlinson (1979), p. 126.
6. *Cal. SP Dom. 1678,* p. 535, order dated 22 November.

barrels to be sent to Upnor[1] and ten years later there was still an estimated 5,000 barrels in the White Tower.[2] It would appear that there was no spare capacity at Upnor and not until the construction of a new magazine at Greenwich in the 1690s did the problem begin to be addressed.[3] By then disaster had nearly struck, for on the morning of 9 July 1691 a floor in the White Tower collapsed sending some 2,000 barrels of powder crashing down on to the floor below.[4]

Conditions surrounding the movement of powder in and out of the Tower were a source of concern, and after Lord Dartmouth was advised of careless behaviour new instructions were issued in February 1684. The Captain of the Guard was to ensure `all Matches be put out and that no Tobacco be taken' by his men during transportation, that hides were placed on the floors of carts and loads covered, while a labourer followed each cart to help prevent spillage.[5] Three months later the orders were re-affirmed with a further instruction that soldiers should not smoke near the White Tower.[6]

Even after the quantity of powder at the Tower began to decline again there was still a great deal of concern about what remained. Following incidents of barrels falling from carts on London Bridge and Fish Street Hill, the Mayor and Aldermen of the City petitioned the Queen on 12 September 1706 in an effort to stop the transportation of powder through the streets of London.[7] By March 1707 the nuisance had resulted in the introduction of a bill to prevent the carrying of large amounts of powder within the vicinity of London Bridge. The bill was dropped with Parliament's prorogation, but the powdermakers promised not to ship any powder within half a mile of the bridge, or to carry more than twenty barrels in a covered waggon within the confines of the City.[8] All this appears to have finally produced a result and in correspondence concerning

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1. WO 55/391, f. 177.
2. WO 55/318, p. 5.
3. Luttrell (1857), Vol. II, p. 359, noted on 13 February 1692 'This week 4000 barrells of powder were tryed at the Tower, with some new invented bombs and mortars'.
4. WO 55/339, p. 87.
5. WO 94/5, f. 55.
6. *Ibid.*, f. 56.
7. WO 55/344, pp. 176-7.
8. WO 47/24, p. 361

enlargement of the Record Office in the White Tower the Ordnance Board advised the Treasury, in March 1716, that a large room in the building had not been used for storing powder since the City's application to the late Queen.[1] In a subsequent memorandum to the Treasury, in January 1719, the Board was able to claim that 'of late' no more than sixty to seventy barrels of powder were kept in the White Tower and those had been removed to the basement.[2]

Gunpowder was, of course, only one of the military commodities held by the late Stuart and early Hanoverian Ordnance Office at the Tower. Unfortunately a lack of surviving remains taken outside the years 1676-92 precludes a detailed statistical analysis of these stores from being attempted. Tomlinson has, however, produced some figures which indicate the state of the remains of brass and iron cannon, and muskets at the major Ordnance depots from 1660 to *c.*1700 (see Appendix D, pp. 197-8 below). A number of general conclusions may be drawn. The Tower remained an important store for brass ordnance but the number of iron guns held there declined markedly from a peak of 2,804 pieces in 1663, to only 152 in *c.*1691, as Woolwich become the chief depository for these weapons in the country. By 1695, Woolwich had also replaced the Tower as the principal saltpetre store, though the Tower must have regained some of its former importance after the basements in the White Tower were fitted out to receive large quantities of the material in 1715 (see p. 86 above). The figures clearly demonstrate that the Tower remained the principal store of muskets, so that it is not surprising that the Small Gun Office there records much evidence for activity and expansion. Indeed, with the sale of the Artillery Ground in the City in 1682, and the setting up of proving facilities on Tower Wharf, the Tower appears to have become the focus for all Ordnance firearm business. As has been stated, the Small Gun Office at this stage was not concerned with the manufacture of arms - other than as patents - rather it examined the parts supplied by outside contractors and carried out repairs. Between 1714 and 1718 the furbishers and the gunsmiths extended and consolidated their activities along the towers of the inner northern curtain wall and behind the Chapel of St Peter ad Vincula, from where

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1. WO 47/29, f. 108.
2. WO 47/32, p. 14. For a mid-eighteenth-century drawing showing proposed new storage arrangements for the powder in the sub-crypt, R.A., Inv. No. I.25.

they conducted much of their operations in the fortress until these facilities were greatly damaged by the fire of 1841 which destroyed the Grand Storehouse.[1] It is difficult to determine how many people were employed in these operations at any given time, but in March 1717 the Keeper of Small Guns, Thomas Gardiner, reported to the Board that there were twenty-one furbishers at work, three sick and twenty-seven not at work.[2]

Whereas the total amount of military equipment stored at the Tower during the late seventeenth and early eighteenth centuries must have increased as the Ordnance assumed control of additional areas, the significance of this must be seen against the wider picture of military developments elsewhere. The task of supplying Britain's expanding armed forces was not an easy one, delays in the manufacturing process and a rudimentary transport system being two adverse factors that the Ordnance had to contend with. The recent study of a train dispatched to Virginia in 1676, as part of the measures taken to put down an insurrection in the colony, helps to illustrate some of the difficulties involved.[3] The train - one of the last to be wholly assembled at the Tower - was organised between July and December 1676 in response to an series of warrants from a Privy Council becoming increasingly alarmed by reports of breakdowns in law and order. It comprised over 1800 muskets and 700 carbines with powder and shot to match, 1500 archaic staff weapons known as 'swine feathers', 2,000 hand grenades and six artillery pieces. Hundreds of shovels, spades, pickaxes. hatchets, hoes, sacks (for building temporary fortifications) and saws were supplied together with knapsacks and hammocks for over one thousand troops. Additional bedding and tents was provided for a detachment of engineers, gunners and gunsmiths from the Ordnance's own establishment, plus a host of miscellaneous provisions ranging from rope, candles, writing paper and even medical supplies. All this was assembled at the Tower and ferried from the Wharf by hoys to the larger ships of the expedition riding in the Long Reach of the Thames. The main body of the flotilla eventually sailed for the Old Dominion on 5 December. By the time the vanguard reached its shores, at the end of January the following year, the rebellion was

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1. In fact the fire was started by one of the forges set up in the upper floor of the Bowyer Tower; WO 44/304, for an internal Ordnance report into the disaster.
2. WO 47/30, p. 80.
3. Parnell (1995).

over, the colony's governor having re-imposed a semblance of royal authority over a desolate land.

In addition to transport difficulties, there was the on-going problem of poor financial provision from both Parliament and the Treasury.[1] The Virginian train for example, including the arming of the ships, cost the Ordnance £11,178.03s.06d, of this £5,972.16s.06d has still not been recovered from the Treasury by the end 1681.[2] By comparison on 27 February 1692 the Lieutenant of the Ordnance was ordered to prepare a train to be immediately transported to Flanders whose estimated cost came to £70,804.11s.09d. Another, designed to be shipped with the summer fleet, was calculated at £119,333.02s.04d.[3] The cost of organising complex and ever larger artillery trains resulted in a severe debt crisis towards the end of the War of Spanish Succession which in turn contributed towards the introduction of a series of reforms after the Duke of Marlborough resumed the mastership of the Office in 1714. By this time it had ceased to be practical for the principal officers and their clerks based at the Tower to take remains and survey stores returned from ships as laid down in their 1683 Instructions. This, together with the dispersal of stores away from the Tower and the rapid growth of Ordnance depots such as Woolwich, Chatham, Plymouth, Portsmouth and Berwick, resulted in the formation of separate establishments of Ordnance personnel in these places.[4] Another example of the diminishing role of the Tower was demonstrated by the fact that as from as early as 1705 the Board of Ordnance itself ceased to meet there on a regular basis. That change and the subsequent acquisition of a second administrative office in Downing Street six years later did not mean that the facilities at the Tower were deemed in some way inadequate, but rather it was an irresistible decision by the Board to relocate itself among the growing Whitehall ministries and the heart of central government.

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1. Tomlinson (1979), pp. 205-7.
2. Parnell (1995), p. 17.
3. Tomlinson *op. cit.* p. 131.
4. See WO 47/33, pp. 238-9, concerning regulations for the outposts dated 14 June 1720.

Against the backdrop of a more restricted role in the Ordnance storage and supply structure, the Tower in 1716 did provide a home for two new establishments - the Drawing Room and the Modelling Room. The former, which began life with a Chief Draughtsman and two or three assistants, went on to make a major contribution towards the training of British cartographers and surveyors in the eighteenth century, producing such names as Paul and Thomas Sandby.[1] By the time of the death of Clement Lemprière in July 1746, the Chief Draughtsman had a permanent staff of six.[2] By the early 1780s, however, this had risen sharply to nearly fifty.[3] What is not widely appreciated is that these developments form the genesis of the present Ordnance Survey which, after its official formation in 1791, continued to operate from the Tower of London until it moved to Southampton in 1841. The Modelling Room, the second establishment created at the Tower in 1716, was no less important to the Ordnance, for it played a key role in the introduction of new patterns for guns and gun carriages. These patterns allowed the Office to exercise much greater control over the production process and thus encourage greater standardisation.

Apart from supplying the armed forces with the means to fight a modern war the Ordnance was also the curator of a large amount of arms and armour of essentially antiquarian interest. It also acquired some surprisingly quirky items of interest. Reference has already been made to the 'Rack of Torment', which by the beginning of the eighteenth century was being exhibited in the Artillery Room of the Grand Storehouse, and which first appears in an Ordnance inventory dated 1675 (see p. 85 above). The same inventory[4] also lists a pair of'`Stocks for Torment' and two wooden statues - possibly the grotesque Jacobean figures known as 'Gin and Beer', which the official Armouries guidebook in 1843 claims were formerly fixed over the Buttery of the old palace at Greenwich,[5] and which can still be seen at the Tower.[6]

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1. Harley & O'Donoghue (1975), p. ix.
2. WO 51/162, f. 33.
3. Harley & O'Donoghue, *op. cit.*
4. R.A. MS.I.1, ff. 839-42.
5. Wheeler (1843), p. 28.
6. R.A. Inv. Nos. XVII.5 & 6.

The emergence in the Tower of public displays of historic arms and armour, in a museum-like manner, is something which can largely be accredited to the late Stuart Ordnance Office, though the origins of the displays can be traced back to Tudor times. In 1592, Jacob Rathger, secretary of Frederick, Duke of Wirtenburg, described a visit to the Tower of London where he and the Duke were shown the Armoury. Despite the presence of many fine pieces of artillery, Rathger did not compare the collections with those in his native Germany for 'they are full of dust and stand about in the greatest confusion and disorder'.[1] He also described how the Duke was shown some historic arms, including a musket that belonged to Henry VIII and a lance of great size which can be identified as 'Charles Brandon's lance' - an item frequently referred to by subsequent visitors and one that was later incorporated in the Line of Kings.[2]

The first description of the Armouries in detail is provided by Paul Hentzner after a visit to London in 1598. He was shown many items belonging to the armoury of Henry VIII, including a gilt suit of armour made for the king and several historic cannon, amongst them two wooden pieces deployed at the siege of Boulogne in 1544.[3] The following year, Joseph Platter, a Swiss traveller of Basle, visited the Tower and minutely described the buildings and their contents. Again, considerable attention was paid to the personal armoury of Henry VIII, which Platter makes clear was located in the White Tower. Interestingly, reference is made to the cost of viewing the Armouries, with payments totalling 21 shillings being made at four points in the building 'to a servant appointed to receive the same'.[4] The cost of viewing the Tower's attractions during the late Tudor and Stuart periods seems to have varied in accordance with the status of the visitor. For example, Lady Judith Barrington gave away 11 shillings in largesse when she visited the fortress in the autumn of 1639[5] while General Patrick Gordon's collective payments

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1. ffoulkes (1916), p. 15.
2. This is still preserved in the Royal Armouries collection at the Tower and identified as Inv. No. VII.550.
3. ffoulkes *op. cit.* p. 65.
4. *Ibid.*, p. 66.
5. Searle (1967), p. 36.

amounted to 33 shillings in 1660.[1] These figures might suggest that visiting the Tower was a rather expensive and exclusive pastime. But in 1611 Henry Peacham remarked:

> 'Why doe the rude vulgar so hastily post in a madnesse
> To gaze at trifles, and toyes not worthy the viewing?
> And thinke them happy, when may be shew'd for a penny'

and then went on to include 'The Lance of John a Gaunt, and Brandons still in the Tower' as part of the impressive range of sights to be seen in London.[2] This suggests that a visit to the Tower might, in fact, have been enjoyed by a fairly wide cross section of the public. In practice the cost had much to do with the fee given to the Yeoman Warder who acted as escort and guide. As Boreman explained in 1740, 'tis customary to give him a gratuity according to your own generosity'[3] and this, by implication, was partly determined by the size of the visitor's purse.

Unlike the 'cabinets of curiosities' which collectors of items of historic, artistic and scientific rarity began to assemble in late Tudor times[4] the Tower of London had the attraction of being a supreme ancient monument. A great deal of dramatic English history was associated with the fortress and many of its buildings and spaces were linked to conspiracy, betrayal and fall from power. Furthermore, because it functioned as a gigantic official warehouse, objects associated with royal and other famous personalities could be found there.

The complaint by Jacob Rathger in 1592 about dust and disorder, which was rehearsed by the Duke of Stettin-Pomerania a decade later,[5] suggests that little attention was paid to

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1. ffoulkes (1916), p. 35.
2. Altick (1978), pp. 7-8.
3. Boreman also lists the entrance fees for the various attractions: Menagerie, 6d; Spanish Armoury, 2d; Small Armoury, 2d; Artillery Room, 1d; Line of King's, 2d; Crown Jewels, 12d, and the Mint by way of a unspecified fee to an official workmen. He also notes that if a visitor viewed the attractions individually, rather than as part of a group, the fee for the Crown Jewels rose to 2s.6d while the others doubled, Boreman (1740), pp. 91-7.
4. Impey & MacGregor (1985). pp. 147-58.
5. Von Bülow (1892), p. 13.

presentation in the late sixteenth and early seventeenth centuries. The emergence of specific displays like the Spanish Armoury and the Line of Kings indicates that the problem was eventually addressed at the Restoration. These early displays were arranged and administered by the Armoury Office, though it is clear that there was a demand to see the Ordnance stores as well and on 22 June 1665 the Board instructed their keepers not to allow 'Stangers & others' to view these areas without prior permission, for the practice was causing `much inconvenience'.[1] The situation changed, however, after the Ordnance assumed control of the Armoury duties in 1670.[2] There is no evidence for a coherent plan to create a sort of national museum at the Tower, but the various displays enlarged or established by the Office before the end of the seventeenth century effectively did so.

The decision to build the Grand Storehouse in 1688 provided the opportunity to expand and re-display the two established collections known as the Spanish Armoury and the Line of Kings. The former was dispatched to the storehouse erected in 1670-1, immediately to the north of the Wakefield Tower, where it was displayed on the first floor until the early years of Queen Victoria's reign.[3] The Line of Kings was moved to the first floor of the New Armouries Building where it was greatly enlarged to form a splendid and entertaining tableau which must have served as an ideological support for the monarchy. The notion of a glorious monarchy could not, however, be presented in an unbiased manner and as Alan Borg has pointed out, this might help 'to explain omissions ... such as Edward II and Richard III, for any element of their characters in the Royal Line were best forgotten'.[4] Ironically this also applied to James II, the monarch who possibly sanctioned, or even ordered, the great re-organisation of the Line.

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1. WO 47/7, f. 98.

2. In 1672 M. Jorevin de Rocheford visited the Tower and made an interesting observation about a display he saw in the Ordnance storehouse north of the White Tower: 'We passed into another hall, and these was nothing but muskets, pistols, musketoons, bandeliers, swords, pikes and halberds, arranged in a very handsome order so as to represent figures of many sorts', ffoulkes (1916), p. 70.

3. Borg (1976), p. 337.

4. *Ibid.*, p. 329.

The third, and greatest, visitor attraction to be seen at the Tower was the Small Armoury set up in the Grand Storehouse under the aegis of John Harris in 1696. The iconographic images that Harris created with some sixty thousand weapons and a mass of wooden carvings cannot be likened to anything that had been seen before. For an organisation primarily remembered for its contribution towards the military side of the nation's life, the Ordnance's commissioning of such an artistic project may appear surprising. As has already been indicated, the decision to embellish architecturally the Grand Storehouse might have been linked to 'the Protestant Triumph' at the end of 1688 (see p. 67 above). The building was probably ready for occupation early in 1692, but the actual fitting out of the Armoury was not authorised until January 1696. The delay can almost certainly be attributed to the War of the Grand Alliance and the great need for storage space that existed in the Tower at that time. In August 1695, however, William III achieved his greatest success against the French with the recapture of the fortress at Namur.[1] This effectively brought about the negotiations that culminated in the Treaty of Ryswick and a formal end of hostilities in September 1697, by which time the demands of the armed forces had considerably diminished. Unfortunately no document has been found which sheds light on the background to the Small Armoury and the events that preceded the order to set it up remain obscure. There is no doubt, however, that the Ordnance sought to create a most fantastic sight in the fortress which had been its home for nearly three hundred years. Though the contents of the Small Armoury and the Artillery Room beneath it were probably not as extensive as the arsenals in Venice and Berlin, and certainly not on the scale of that in Paris,[2] the ingenuity of Harris's work gave the Grand Storehouse arsenal a uniqueness that surpassed any of its European contemporaries.

Turning now to the building record of the Ordnance at the Tower, the results need to be seen in the context of the building practice and record of the department in general throughout the late seventeenth end early eighteenth centuries. The annual expenditure

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1. It might be worth mentioning that William's presence in the Small Armoury was recorded with a collection of arms captured from a group of Jacobite supporters who conspired to assassinate the king in February 1696, Hatton (1708), p. 636; Maitland (1756), p. 167.

2. For a view of the Paris Arsenal published in 1702, Remy (1702), fig. 95, p. 300.

on construction works rose steadily from approximately £10,000 *per annum* in 1660, to £30,000 *per annum* under James II, and £50,000 under Queen Anne.[1] During this period, and despite temporary fluctuations, labour and material costs remained relatively stable, with only modest increases recorded in certain areas. In 1662 for example, masons, carpenters, bricklayers and plasterers, received 2s.6d per day, while sixty years latter their rates had risen to 3 shillings per day. Plumbers commanded a rate of 3 shillings per day throughout the whole period, while labourers pay had risen overall from 1s.6d or 1s.8d per day to 1s.10d or 2 shillings per day. Plain roof tiles could be bought for 30d per load in both 1662 and 1722, sand remained unaltered at 4 shillings per load, as did lead at approximately 23 shillings per hundredweight.

The process whereby the Ordnance, essentially through the office of the Surveyor-General, planned and commissioned building works, changed little throughout this period, the duties of those officers involved being set down in the 1683 Instructions. After 1716, however, control over design was subject to much greater regulation following the setting up of the Drawing Room at the Tower and the introduction of a recognisable architectural style now widely referred to as `Ordnance Vanburgh' (see below). Prior to this, and despite the gradual introduction of standard forms for storehouses, barracks and magazines, the prevailing architectural style was mannerist with individual designers (namely the Ordnance engineers) and the contracted builders producing, to some extent or another, works of individual expression (*cf.* John Scott's decorative timbers in the New Armouries Building). No contractor enjoyed a monopoly of work at the Tower during the late seventeenth and early eighteenth century, though several played prominent roles. Thomas Norfolk and John Scott provided much of the brickwork and carpentry in the years immediately after 1660 as they had done before the Restoration. In the late 1660s Thomas Case became the dominant carpentry contractor, followed by Thomas Moore during the early 1680s, Henry Haywood in the 1690s and the William Ogborne shortly after 1700. A good deal of brickwork throughout the last decades of the seventeenth century was provided by individual members of the Fitch family, though Robert Fitch, who took over the contract from his father William during the early 70s, worked more

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1. Barker (1993), p. 200.

often in conjunction with the master bricklayer John Downes, than his brother John. The third brother, and best known member of the family, Sir Thomas Fitch, is linked to only one building at the Tower, the Grand Storehouse. This example is exceptional in another respect, in so far as the contract embraced nearly all aspects of the building work, rather than just brickwork. The last major project undertaken by a member of the family, Robert Fitch, evidently son of John, concerned the great houses erected for the Surveyor and Clerk of the Ordnance in 1699-1701 (see pp. 103-4 above), thereafter the scene was dominated by the Lidgebird brothers. The most important mason at work in the fortress, was John Churchill, who was active after 1700 and responsible for some unusually large amounts of stonework employed in the alterations to the White Tower and Middle Tower.

Many of the buildings erected by the Ordnance at the Tower do not compare closely with contemporary structures built by the department elsewhere in the country, notably those in the expanding complexes at Plymouth, Woolwich, Portsmouth and Chatham. The plan and form of many of the Tower buildings were, to a large extent, determined by the physical constraints of a crowded fortress and often the co-operation, or lack of it, of the official occupants of adjoining properties. Few new buildings were entirely free-standing, most being erected against curtain walls and/or between existing structures. A greater amount of work was carried out within the shells of existing buildings. These can be classed as refurbishments, as in the case of the White Tower, or virtual reconstructions, as represented by the 1672-3 administrative office.

The presence of a clearly defined Ordnance architectural style, plain, bold, and at times almost medieval in grammar, was first identified by Lawrence Whistler over forty years ago.[1] Whistler pointed to similarities in the work of Hawksmoor and Vanburgh and showed that the Ordnance buildings with these characteristics had been erected *c.*1716-22. Unable to find any documentary reference for an architect, Whistler wrestled with the problem, at first favouring Vanburgh,[2] and then reversing his opinion in favour of Hawksmoor.[3] There the matter rested until Richard Hewlings recently discovered a

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1. Whistler (1952).
2. Whistler (1954).
3. Whistler (1955).

sketch design for the Ravensdown Barracks at Berwick-upon-Tweed (one of the earliest buildings in the Vanburgh-Hawksmoor style), which, although unsigned, is almost certainly the work of Hawksmoor.[1] On the available evidence, therefore, it would seem that Hawksmoor produced the architectural outline for the Berwick barracks, which in turn provided the inspiration for an institutionalised Ordnance building style. The question remains, however, who within the department actually designed the buildings using the Hawksmoor grammar? Ordnance engineers by this time, like contractors, were assigned to separate divisions, though the idiosyncratic style of 'Ordnance Hawksmoor', as perhaps it should now be called, is common to buildings from Berwick to Plymouth. One obvious candidate was Andrews Jelfe, the well-known masonry contractor and architect, who was appointed architect to the Ordnance in January 1719 (see p. 94 above). Whistler, and more recently Barker,[2] discounted Jelfe's possible contribution on the basis that many of the designs pre-date his appointment. This argument must be rejected now in view of the discovery that Jelfe was employed by the Ordnance from as early as July 1716, specifically to prepare drafts. Presumably he carried out the task satisfactorily, hence his appointment as architect in 1719. The appointment, however, needs to be qualified by the fact that it was intended as a replacement for James Smith who occupied the post of Clerk of the Works in North Britain (i.e. Scotland)[3] and as far as Jelfe's bills for 1719 are concerned, Scotland is where he was to be found.[4] In January 1720 Jelfe was ordered to Plymouth to oversee the new building work on the Gun Wharf.[5] He remained in the West Country until the end of December 1723[6] when his name disappears from the Ordnance records, though nominally he held the post of 'Architect' until 1727.[7]

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1. Hewlings (1993).
2. Barker (1993), p. 212.
3. WO 47/32, pp. 21-2.
4. WO 51/104, f. 97. An exception probably took place in March 1719, when Jelfe was ordered by the Board to amend a Berwick drawing, WO 47/32, p. 91.
5. WO 47/33, p. 36.
6. WO 51/113, f. 51.
7. Colvin (1978), p. 979. Jelfe re-appears in the records of the Ordnance during the mid 1730s in his capacity as a masonry contractor, *cf.* WO 51/137, f. 89, for his work at the Tower infirmary (i.e. St Thomas's Tower) where vestiges of his endeavours can still be seen.

Doubtless as detailed research into other Ordnance sites is undertaken more buildings in the Hawksmoor manner will be identified. At the Tower this search has revealed several: the extension to the Ordnance office, Carriage Storehouse, Main Guard, Mr Levin's house, the alterations to the Middle Tower and an unexecuted design for the enlargement of the Jewel House (see Figs. 26, 34, 36, 57 & 59 below). All were designed or executed by 1719 and although this ante-dates Jelfe's move to Scotland it is most unlikely that he was concerned with all, or indeed, any of them. The uneven architectural competence evident in the designs also mitigates against any single author. What some of these drafts do share, in common with designs for buildings in other Ordnance depots at this date, is a consistent style of draughtsmanship, which frequently includes the identical use of scales and headings. There is no doubt that the majority of these drawings are, in fact, the work of the draughtsmen in the Drawing Room at the Tower, who clearly played a leading role in the building design and contract process.

Lastly, what of the Ordnance's involvement in maintaining what Stow described as a citadel 'to defend or command the Citie' and indeed in the wider geographical picture what part did the Tower play in the defence of the Thames? In common with many other fortifications that the Ordnance was responsible for by 1660, the defences of the Tower were hopelessly inadequate by the military standards of the day.[1] The commission established in 1664 (see p. 43 above) indicates that the situation was recognised and under review, but it was not until the disastrous Dutch raid on the Medway in 1667 that the problem attracted a sense of urgency. Consequently, between 1669 and 1672, measures were taken to improve the condition of the moat and to strengthen the western entrance. This must be seen as part of a much wider programme of works to upgrade the defences of the Thames and Medway which began in the late 1660s and continued into the 1680s. The plan included the replacement of the defences around Sherness, the building of two redoubts at Gillingham and Cockham Wood to protect Chatham, and the creation of a great bastioned fort at Tilbury.[2]

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1. Other medieval castles used by the Ordnance as magazines or defences included Dover, Scarborough, Windsor, Tynmouth, Carlisle and Chester, see Tomlinson (1973), pp. 5-6.

2. Saunders (1960), pp. 158-64; Saunders (1989), pp. 92-7; Tomlinson (1973), pp. 7-8.

In the wake of the Third Dutch War, a continuing perception of a water-borne threat is demonstrated by the strengthening of the Tower's river defences in 1680 (see pp. 49-50 above). With works in the upper reaches of the Thames nearing completion, however, the danger receded as evidenced by the decision in 1683 not to proceed with de Gomme's plan for a redoubt at the eastern extreme of the Wharf.[1]

The third, and final, phase of improvements to the Tower's defences during the reign of Charles II began in 1682 and was directed towards the landward side and the re-organisation and enlargement of the garrison within the walls. These measures may be seen against a background of domestic difficulties that the king experienced in connection with the Popish Plot and the part that London played in the acquittal of the Earl of Shaftesbury on the charge of high treason. Shaftesbury's subsequent call for Monmouth to raise London in revolt came to nothing and although the earl was forced to flee to Holland the incident provided a sombre reminder of the part that London could play in undermining royal authority.[2] It is significant, therefore, that in April 1681 the Ordnance officers reflected on the value of building fortifications for reasons of internal security when they remarked that the raising of money for this purpose was:

> 'without question to be admitted of ... especially at this time when the misguided multitude are so much disposed to mischief and the malice of disloyal and ambitious persons so industriously contriving the disturbance of his Majesty's government'.[3]

The efforts of the Ordnance to strengthen the Tower's defences during Charles II's reign were considerable, but it is difficult to judge the results as anything other than cosmetic, as the plan and appearance of the defences remained firmly rooted in the medieval tradition. Why should Sir Bernard de Gomme, the engineer responsible for directing the works, and a man recently described by a leading military historian as England's answer

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1. Tomlinson (1973), p. 7, incorrectly states that the work was carried out.
2. Lockyer (1964), pp. 349-53.
3. Tomlinson (1982), p. 46.

to France's Vauban and the Netherland's Cohern,[1] appear to have failed so completely in this task? It is clear that de Gomme considered radical solutions involving the introduction of a bastioned system, but the executed scheme relied on a myriad of timber gun platforms built upon the roofs of the tall medieval towers and against their intervening curtain walls. These positions would have been extremely vulnerable to artillery, but in the event they proved to be as susceptible to the weather. Decayed, and deemed militarily useless anyway, they were dismantled after little more than thirty years. In fairness to de Gomme, the constraints imposed on the site by the various government departments probably prevented him from pursuing any other solution. It was of course the need for security which had seen these bodies evolve within the walls, but by the sixteenth century they had so crowded the confines of the castle that any major alteration of the defences would have seriously disrupted their operations. Alternatively, it may be suggested that although unsophisticated, the refortifications were, in fact, adequate enough to deal with the principal threat - the London mob. In all probability de Gomme's approach was determined by a mixture of physical constraints and the local nature of the threat.

The structure and appearance of the Tower batteries probably had more that an echo of an earlier programme of refortification undertaken in 1670-4 at another great medieval fortress - Windsor Castle.[2] The work was executed under the general direction of the Constable, Prince Rupert, whose idiosyncratic decoration of his official lodgings in the Round Tower have already been described (see pp. 77-8 above), but the day-to-day supervision appears to have been the responsibility of Edward Wise, the resident Ordnance Storekeeper. It is unfortunate that a 'Booke of perticulars', in which Wise kept a record of building work and costs,[3] has not survived, and it is therefore not possible to reconstruct the sort of detailed picture that has been feasible at the Tower. Nevertheless it is clear that timber gun platforms were installed, both as replacements and as new positions, at various points along the towers and walls of the outer defences. Like the

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1. Saunders (1989), pp. 83-101.
2. *Cal. SP Dom. 1670*, pp. 195, 222 & 226; *Cal. SP Dom. 1671*, pp. 320-1 & 354-5.
3. Rendered by Wise to the Ordnance Treasurer, *cf.* WO 51/12, f. 100; WO 51/14, f. 112.

Tower, these represented a long-established means of adapting medieval defences, in preference to replacing them. Recent archaeological work at the Round Tower has shown that a good deal of 1670s fabric is still present in the Carronade that encircles the base of the keep. On 19 May 1670, Wise advised his superiors that the old masonry would need to be reduced and underpinned to prevent a collapse.[1] Investigations have shown that the exposed brickwork of the 1670s was rendered and lined out to imitate existing stonework, while the 'picturesque' looking gun openings and firing steps to the breastwork are also of the same date.[2] It is clear, therefore, that considerable attention was paid to the architectural appearance of the Carronade, indeed to make it more 'hansumer' as Wise put it in his letter of May 1670. There is no evidence that the same sensitively was paid to the historic setting of the Tower (for example no attempt was made to conceal exposed brickwork). The contrast can no doubt be attributed to the presence of Prince Rupert and indeed by the fact that the Windsor, unlike the Tower, was still very much a royal residence.

Apart from the Carronade, there is one other small, but immensely important, feature at Windsor which may be associated with the refortifications of the 1670s. This is located in an embrasure on the upper floor of the Curfew Tower, on the north-west corner of the Lower Ward, and comprises a culverin mounted on a two-wheeled standing carriage, which in turn is planted on a boarded platform that is slightly raked to provide elevation. Apart from representing the only known seventeenth-century gun carriage in this country, and indeed the only surviving seventeenth-century gun platform of its kind, this remarkable arrangement provides a tantalising glimpse of how some of the smaller emplacements at the Tower might have appeared during the reign of Charles II.[3]

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1. Hope (1913), p. 309.

2. I am most grateful to Brian Kerr of English Heritage's Central Archaeological Service for discussing the findings of his work with me and for allowing me to examine some of the site records.

3. The gun covers the crossing of the Thames from Eton. During the restoration of the Curfew Tower by Salvin in the 1860s the builders simply worked around the emplacement, though the ring pins that must have tethered the gun to the wall were lost when the window opening was repaired. The gun itself probably dates from the first half of the seventeenth century and the possibility that it was introduced during the time of the civil war or the Commonwealth cannot be excluded. I am most grateful to my colleagues at the Royal Armouries, Robert Smith and Nicholas Hall, for inspecting the gun and its carriage and for giving me the benefit of their advice.

Attempts to improve the accommodation of the garrison at the Tower represent another notable area of Ordnance activity during the reign of Charles II. A permanent garrison in the modern sense was evidently established during the Commonwealth, when as many as eight, but usually six, companies of the regiment raised by Colonel John Berkstead (the Parliamentary Governor of the Tower) were quartered there.[1] The number during the reign of Charles II fluctuated. In 1661 and 1663 there were only three companies,[2] but following implementation of the recommendations set down in the 1682 report the number probably doubled.

Apart from protecting the Tower, the troops billeted in the fortress performed the equally important task of policing the surrounding areas together with other portions of the army permanently stationed in and around London: the Life Guards were at Westminster and Whitehall, two companies of foot were posted at Scotland Yard, two companies of the Coldstreamers were quartered at St James Park and Palace, and one troop from the Royal Horse Guards was permanently quartered in Southwark.[3] The police role of the Tower garrison was clearly demonstrated when detachments were called out to quell riots: in 1689 and 1696 the Lords ordered Lord Lucus, the Lieutenant of the Tower, to prevent 'an unusual concourse of people in Tower Hamlets'. A regiment was sent under arms to break up a riot in Southwark in 1693 while four years later troops were dispatched to Westminster, almost an hour's march away, to help suppress another riot. Much closer at hand, the Constable was ordered on 4 June 1719 to suppress disorders about the Tower itself and on 15 May 1722 he was instructed to provide military aid to the Bank of England, the South Sea Company and the East India Company.[4]

Another method of policing was demonstrated during the reign of James II when, on 19 February 1686, part of the Tower garrison was ordered to be quartered on two City meeting houses said to be frequented by people 'disaffected' with the government, while a third and an adjoining property were to be converted into a hospital for the garrison and a

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1. Firth (1940), p. 341.
2. Reid (1978), p. 138; PC 6/18, p. 49.
3. Childs (1976), pp. 66-7.
4. WO 94/5, ff. 105-7.

residence for the Ordnance surgeon and his staff.[1] Reference has also been made to five heavy mortars that were trained on the City in February 1685 at the start of James's reign (see p. 57 above). In November 1688, just weeks before James fled into exile, the Lieutenant of the Tower succeeded in getting another mounted on the basis of the king's verbal order, rather than a signed warrant from the king or the Privy Council as Philip Musgrave, the Ordnance Clerk of the Deliveries, had demanded.[2] At the same time the Master-General, Lord Dartmouth, was urging the King to look into the affairs of the Ordnance Office and its officials, as the armed forces on land and at sea relied so heavily on the good execution of their business. It was advice like that which contributed towards Dartmouth's fall from power in April 1689. The same consideration, however, was evidently shared by William of Orange who, according to Sir Edward Sherburne, Clerk of the Ordnance, was more concerned with securing the Tower than restoring a free parliament.[3] Whether succeeding claimants to the English throne would have placed such an emphasis on securing the fortress is questionable. For as this account has attempted to show, the Tower, by the closing years of the seventeenth century, was losing its centuries-old dominance as the great arsenal of the kingdom. That a medieval castle in the centre of London should have played the role for as long as it did is perhaps a tribute, or a condemnation, of a structure of government that has evolved but gradually, and which does not readily change the practices it has become accustomed to.

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1. WO 55/334, f. 34; WO 47/16, f. 3.
2. D.1778 I.i.1572, Musgrave to the Master-General, 22 November 1688.
3. Bodleian Library, Wood F 40, f. 285, Sherburne to Wood, 4 December 1688.

CATALOGUE OF ORDNANCE DRAWINGS

The following list contains descriptions of all the Ordnance drawings that have been identified as belonging to the period under discussion. Many of the drawings bear evidence of having been indexed at some stage or other, but two sets of markings are of particular interest and are thus quoted, wherever they exist, together with current references. The earliest index is represented by a sequence of numbers prefaced 'B.10.T'. There can be little doubt that this is an Ordnance index with the 'T' perhaps representing the Tower. The last number is arranged in a sequence which is consistent with the chronology of the drawings, thus the lowest number is found on the oldest drawing. The index can be assumed, therefore, to have been applied as drawings were produced, or possibly added at a later date on the basis of an accurate record. The second index of numbers, prefaced 'Z⁶/', was used by the War Office, the department which took over the duties of the Ordnance in 1855, and has been identified on a list of drawings that was transferred to the Office of Works from the War Office in 1903.[1]

I. (Fig. 46). R.A. Inv. No. I.73.6.

Plan of the outer defences of the Tower and surrounding areas. Endorsed 'Sir Ber: de Gomme fec. 1666'. Scale of approximately 100ft to 1½ inch. The plan is principally concerned with de Gomme's scheme to reform the defences of the Tower in the immediate aftermath of the Great Fire (see pp. 43-4 above). The extent of the fire damage is indicated by the disposition of houses along the street pattern. A proposed great ravelin at the western entrance is covered by an overlay which depicts the Bulwark, Lion Tower and other gate-houses which the outwork was intended to replace.

II. (not illustrated). P.R.O. WORKS 31/21.

Plan of the outer defences of the Tower closely related to I, *c.*1666. Scale of 100ft to 1½ inch. In the top left-hand corner is entered 'A Copy of Mr Howards Mapp verifyd by Jonas Moore'.

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1. A copy is found on English Heritage file CB 70/A.

III. (Fig. 47). Bodleian Library, Gough Maps, Vol. 21, f. 40b.
Rudimentary plan of the outer defences of the Tower showing proposed addition of artillery bastions, *c.*1666. No scale given. This is probably a design prepared by Sir Bernard de Gomme in the wake of the Fire of London. It is worth noting that the bastions on the north-west, north-east and south-east corners have *fausse-brayes* to their flanks to accommodate additional tiers of guns. Similar arrangements were employed in a number of de Gomme's designs, notably those for Tilbury Fort and in a plan for the refortification of Portsmouth, drawn in 1668, in which they are described as `base flanks'.[1]

IV. (Fig. 49). R.A. Inv. No. I.73.29. Reproduced by London Top. Soc. as Publication No. 129 (1983).
Plan of the Tower and its Liberties in 1682. Scale of 50ft to an inch. Though undated, the index demonstrates that the drawing accompanied a transcript of a report on the state of the Tower's defences and the accommodation of the garrison which was entered in the Ordnance records in July 1682 (see Appendix B, pp. 177-93 below). This is a particularly important drawing representing as it does the oldest surviving survey of the Tower's defences and buildings in an accurate two-dimensional form. Besides showing the buildings allocated to the various government departments, including for the first time those of the Mint in the Outer Ward, the plan marks the location of gun batteries (each gun represented by a dot), as proposed in the 1682 report.

On the right-hand side of the plan is the index which, though partly spoiled, reads as follows:

A The soldiers houses
B The severall Warders houses
BC Broad Arrow Tower
D Salt Tower
P Martin Tower
Q The Loyons Tower
R The sutlers houses
S The Luietenents

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1. Saunders (1989), pp. 91-2.

E	Queen Elizabeth Chapell and now the Constables	T	an Officers Lodgings
		V	Bloody Tower
F	Constable Tower	W	The Treasurer of the Ordnances Lodgings
G	The Jewel Tower		
H	Bricke Tower	X	St Thomas's Tower
I	Bowyers Tower	Y	The By Warders Gate
K	Flint Tower	Z	Warders hall
L	Diverin Tower under there is a large Vault	1}	Officers lodgings
		2}	" "
AM	Bauchamps Tower	3}	" "
N	The Bell Tower	4	Stables and Wash houses
O	The Gate Tower	5	severall Coach houses

The drawing has three overlays. The first, at the east end of the Wharf, conceals a rough design for a four-sided redoubt identical to that proposed by de Gomme in 1683 (*cf.* **V** below). The second, at the west end of the Wharf, covers another secondary sketch, again probably the work of de Gomme, for a defensive wall, moat and bridge. The third, immediately east of the Beauchamp Tower, conceals two walled gardens and a building that functioned as the main guard. All of these structures were demolished to make way for a parade ground in 1685 (see pp. 55-6 above). The position of the replacement main guard, erected in the same year, has been added near the north-west corner of the White Tower.

Curiously, the plan depicts a substantial triangular bastion towards the river, immediately south of St Thomas's Tower. Unlike the alterations outlined above, this appears to form part of the original draft. However, no such structure ever stood here and no further documentary evidence for one has been found.

V. (Fig. 54). P.R.O. SP 29/429, no. 207, f. 725.

Sketch plan of the eastern defences of the Tower drawn by Sir Bernard de Gomme in 1683. No scale given. This drawing accompanied de Gomme's proposals to fortify the end of the Wharf towards St Katherines (see pp. 56-7 above). The plan shows his design

for a four-sided redoubt with walls attached to the north and south and with a new moat to the east traversed by a drawbridge. The dots about the proposed works and along the outer defences of the Tower represent artillery dispositions. To the rear of the redoubt is the defensive cross wall erected in 1680 (see p. 50 above) with the `proof house' and charging house (unlabelled to the south) erected against it in 1682 (see pp. 108-9 above).

VI. (Fig. 55). Soc. of Antiquaries, *Vetusta Monumenta*, Vol. 4 (1815), Plate XXXIX. Copy of a three-dimensional plan of the Tower prepared by Holcroft Blood in 1688 with a detailed building index that almost certainly accompanied the original. No scale given. By the standards of the late seventeenth century the drawing is rather old fashioned having been executed in the bird's eye view tradition. The survey formed the centre-piece of a set of drawings for which Blood received £79.16s.00d in a bill dated 26 June 1688.[1] In the account the plan is described as a 'Draught of the Tower Rais'd in Perpective upon the Ground Platt'. Together with 'Ornaments' it took some four months to prepare for which Blood received £40. He was paid another £5.10s.00d for mounting the drawing on a wainscot panel and for setting it in a frame. In the same bill Blood received £24 for another two ground plans prepared over a ten-week period. The plans were evidently identical and embellished with ornamentation and gilding similar to that applied to the bird's eye view. Together with three prospects (see **VII** below) these drawings appear to form a comprehensive survey of the Tower recording the very considerable improvements that were carried out to the defences and the accommodation of the garrison in the wake of the 1682 report (see pp. 52-6 above). The fate of all the original drawings is not known.

VII. (Fig. 56). Soc. of Antiquaries, *Vetusta Monumenta,* Vol. 4 (1815), Plate XLI. Copies of three prospects of the Tower taken from the north, south and north-east by Holcroft Blood in 1688. No scales given. All three drawings were presumably copied from Blood's originals, though only one, the 'Northeast Prospect', can be identified on the bill of 26 June 1688 for which Blood received a payment of £2.[2] It must be

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1. WO 51/36, f. 125.
2. *Ibid.*

assumed, therefore, that the south and north views were recorded in a separate account, though the contemporaneous nature of the three drawings is not in doubt.

VIII. (not illustrated). P.R.O. WORKS 31/22. Former WO ref. $Z^{46}/_{68}$.
Plan of the first floor of the Martin Tower and adjoining parts labelled `A Plan of the first Story of the Jewel house in the Tower of London, taken August the 15th 1702'. Scale of 5ft to an inch. The Jewel Keeper's dining room, parlour and kitchen are shown, together with a staircase leading 'upp to the Chamber' on the uppermost floor. An external staircase is depicted against the curtain wall immediately to the west of the tower with a gallery connecting it to the Keeper's accommodation.

The Jewel House was the responsibility of the Office of Works and it is not clear why the Ordnance should have commissioned this survey. Perhaps the drawing, together with **IX** and **X** below, is connected with a scheme revealed in later correspondence (see p. 134 above) and drawings (see **LXI** below) to remove some appendages to the Jewel Keeper's apartment that were deemed to be too close to the Grand Storehouse.

IX. (not illustrated). P.R.O. WORKS 31/66. Former Ordnance ref. B.10.T.32.
Former WO ref. $Z^{6}/_{14}$.
Copy of **VIII** above, dated 1706, but includes the proposed addition of a closet and book store against east curtain wall, near the ground floor entrance to the Jewel Office.

X. (not illustrated). P.R.O. WORKS 31/67. Former Ordnance ref. B.10.T.33.
Former WO ref. $Z^{6}/_{14}$.
Similar to **IX** above and also dated 1706, but includes a proposed addition against the external angle of the Martin Tower and east curtain wall and a new chamber block and staircase on the site of the outbuilding against the inner face of the north curtain.

XI. (Fig. 10). English Heritage photo ref. E910229 (original drawing recently transferred to the P.R.O. but at present not shown on the WORKS class list). Former WO ref. $Z^{6}/_{13}$. Former Ordnance ref. B.10.T.2.
Plan of the Tower and its Liberties, early eighteenth century. Scale of 100ft to an inch. The drawing carries the date 1692 in the top right corner, but this was evidently added later and cannot be relied upon as accurate. A *terminus post quem* for drafting is provided by the depiction of the houses erected in 1699-1701 for the Surveyor and Clerk of the Ordnance to the north-east of the White Tower (see pp. 103-4 above), while a *terminus ante quem* is provided by the sheds about the White Tower, which were not removed until 1716 (see pp. 87-8 above). While accurate in most respects it should noted that there is no evidence for a bridge seen to cross the moat on the west side of St Thomas's Tower.

XII. (not illustrated). P.R.O. WORKS 31/22. Former WO ref. $Z^{46}/_{68c}$.
Duplicate of **XI** above, with proposals for refortification added at a later date. These include a series of massive *orillon* bastions to the three landward sides of the castle, accompanied by enlargements to the moat, and a series ditches cut through the Wharf traversed by drawbridges; presumably the latter were intended to impede a riverside assault. The author of the scheme is not known and like de Gomme's earlier ambitious plans for refortification was never put into effect.

XIII. (not illustrated). Government Art Collection ref. GAC45. Former War Office ref. $X^{51}/_{4}$.
Elevation of the south front of the Grand Storehouse by John Hanway, *c.*1710. Scale of 10ft to an inch. John Hanway became an Ordnance engineer in 1704 and drawings he prepared of Harwich in 1709 are preserved in the Public Record Office.[1] The verso of the storehouse drawing bears an added inscription also attributing authorship to Hanway but includes the misleading date '1774'. Similar endorsements can be found on five copies of the drawing in the Public Record Office, two of which are identified as the

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1. Anon. (1967), pp. 44-5 & 136.

work of Ordnance cadet draughtsmen, with one bearing the date 1801.[1] Since all the endorsements are in the same hand as the accompanying War Office reference numbers, it may be supposed that they were added after the Ordnance drawing collection was transferred to the War Office in 1855.

XIV. (not illustrated). P.R.O. WORKS 31/52. Former WO ref. $Z^6/_{21}$.
Roof plan and profile of the Bell Tower, 1715. Scale of 4ft to an inch.
This forms part of a comprehensive survey of the mural towers now scattered in the collection of Tower drawings at the Public Record Office. There are fourteen drawings in total (**XIV - XXVII**) recording most of the towers along the inner and outer walls, with the inner towers numbered in a clockwise pattern, beginning with that of the Bell Tower which is marked no. 1.

All the drawings are the work of one hand, with the inner towers taking the form of a simple profile and roof plan which notes the height of the gun platforms above ground level and adjoining features such as wall-walks. The drawings cannot have been prepared after 1715 when most of the platforms were removed (see p. 60 above). Indeed, it seems reasonable to assume that the drafts were prepared in association with the reductions. Confirmation seems to be provided by the list of plans forwarded to the Office of Works from the War Office in 1903 in which the drawings are dated 1715.

XV. (not illustrated). P.R.O. WORKS 31/51. Former WO ref $Z^6/_{16}$.
Roof plan and profile of the Beauchamp Tower. Scale of 4ft to an inch. Drawing marked as no. 2 in the survey of 1715. The drawing was originally captioned as 'Heymans' Tower, but was altered to 'Beauchamp', perhaps almost immediately, if the hand writing is anything to go by.

XVI. (Fig. 37). P.R.O. WORKS 31/61. Former WO ref. $Z^6/_{16}$.
Roof plan and profile of the Devereux Tower. Scale of 4ft to an inch. Part of the survey of 1715. The section is captioned 'Profile for the Gun smiths aparttment'. The

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1. MPH 212; MR 480.

position of the gun platform over the 'Leads' is represented by indents only, presumably indicating that the device had already been removed when the survey was taken.

XVII. (not illustrated). P.R.O. WORKS 31/62. Former WO ref. $Z^6/_{16}$. Former Ordnance ref. B.10.T.8.
Roof plan and profile of the Flint Tower. Scale of 4ft to an inch. Scale of 4ft to an inch. Drawing marked as no. 4 in the survey of 1715.

XVIII. (not illustrated). P.R.O. WORKS 31/53. Former WO ref. $Z^6/_{17}$.
Roof plan and profile of the Bowyer Tower. Scale of 4ft to an inch. Drawing marked as no. 5 in the survey of 1715.

XIX. (not illustrated). P.R.O. WORKS 31/57. Former WO ref $Z^{6}/_{18}$. Former Ordnance ref. B.10.T.10.
Roof plan and profile of the Brick Tower. Scale of 4ft to an inch. Drawing marked as no. 6 in the survey of 1715 and labelled 'Plan and Profile of the Tower Mr Watson lives in'.[1]

XX. (not illustrated). P.R.O. WORKS 31/68. Former WO ref. $Z^6/_{18}$.
Roof plan and profile of the 'Jewel' [Martin] Tower. Scale of 4ft to an inch. Drawing marked as no. 7 in the survey of 1715.

XXI. (not illustrated). P.R.O. WORKS 31/59. Former WO ref. $Z^6/_{19}$.
Roof plan and profile of the Constable Tower. Scale of 4ft to an inch. Drawing marked as no. 8 in the survey of 1715.

XXII. (not illustrated). P.R.O. WORKS 31/56. Former WO ref. $Z^6/_{19}$.
Roof plan and profile of tower 'adjoining to Mr Blakes' i.e. Broad Arrow Tower.[2]
Scale of 4ft to an inch. Drawing is marked no. 9 in the survey of 1715.

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1. Jonas Watson was the then Ordnance Chief Bombardier, Tomlinson (1979), p. 238.
2. This is a reference to John Blake, First Clerk to the Lieutenant-General (Tomlinson, *ibid.*, p. 227), who lodged close by in the Old Hospital Block.

XXIII. (not illustrated). P.R.O. WORKS 31/76. Former WO ref. $Z^6/_{20}$.
Roof plan and profile of the Salt Tower. Scale of 4ft to an inch. Drawing marked as no. 10 in the survey of 1715.

XXIV. (not illustrated). P.R.O. WORKS 31/69.
Roof plan and profile of 'Queen Elizabeths Tower' i.e. Lanthorn Tower. Scale of 4ft to an inch. Drawing marked as no. 11 in the survey of 1715.

XXV. (not illustrated). P.R.O. WORKS 31/75. Former WO ref. $Z^6/_{21}$.
Roof plan of the 'Record' [sc. Wakefield] and Bloody towers with profile of the latter. Scale of 4ft to an inch. Drawing marked as no. 12 in the survey of 1715. It is interesting to note that the drawing labels the Wakefield Tower as the 'Hall Tower', presumably a reference to the former medieval great hall which was situated a short distance to the east.

XXVI. (not illustrated). P.R.O. WORKS 31/174. Former WO ref. $Z^6/_{15}$.
First floor plan and profile of Legge's Mount. Scale of 5½ft to an inch. Part of the 1715 survey. Indicates gun batteries and level of `Low Water in the Ditch'.

XXVII. (not illustrated). P.R.O. WORKS 31/161. Former WO ref. $Z^6/_{15}$.
Plan of the 'Upper Platforme of the Brass Mount'. Part of the 1715 survey. Scale of 10ft to an inch.

XXVIII. (not illustrated). P.R.O. WORKS 31/160. Former WO ref. $Z^6/_{15}$. Former Ordnance ref. B.10.T.4.
Plan and section of the 'Gun Gallery under Brass Mount'. Part of the survey of 1715. Scale of 10ft to an inch. This is a survey of the original thirteenth-century mural gallery of the mount which was adapted for artillery in 1682-3 (see p. 53 above). The plan also shows a proposed stair passage from the gallery to the roof platform overhead. An extant doorway, forced through the masonry on the south side of the passage at this point, suggests the proposal was implemented.

XXIX. (Fig. 14). P.R.O. WORKS 31/109. Former WO ref. $Z^6/_{22}$. Former Ordnance ref. B.10.T.18.
Ground floor plan of Grand Storehouse and its environs drawn in 1715. Scale of 10ft to an inch. Part of a general survey of the building which includes **XXX** and **XXXI** below.

XXX. (Fig. 16). P.R.O. WORKS 31/106. Former WO ref. $Z^6/_{22}$.
First and attic floor plans of Grand Storehouse drawn in 1715. Scale of 10ft to an inch. Part of a general survey of the building which includes **XXIX** and **XXXI.** The plan of the first floor is particularly interesting as it provides the earliest depiction of the layout of the Small Armoury which can be compared with Lewis Petit's survey carried out three years later (see **LI** below).

XXXI. (Fig. 15). P.R.O. WORKS 31/110. Former WO ref. $Z^6/_{22}$. Former Ordnance ref. B.10.T.20.
Two sections through the Grand Storehouse drawn in 1715. Scale of 10ft to an inch. Part of a survey which includes **XXIX** and **XXX** above. The exact positions of the sections are indicated on **XXIX.** Both sections depict the framing of the roof structure and A-B the great cupola and stairs that provided access to it. A-B also depicts two of the great columns in the centre of the Small Armoury with their twisted mouldings and marks the ceiling pendant installed between them (see p. 76 above). At the same level C-D shows two of the great chests that held small arms; the section also includes an interesting view of the Flint Tower, indicating that the ground floor was roofed with a vault, a feature that presumably disappeared when the building was reconstructed in 1796.[1]

XXXII. (Fig. 8). P.R.O. WORKS 31/119. Former WO ref. $Z^6/_{24}$. Former Ordnance ref. B.10.T.21.
Outline plan of the Coldharbour storehouse located on the north side of the Wakefield Tower, dated 1715. Scale of 10ft to an inch. The building, erected in 1669-70 (see pp. 35-6 above), is captioned 'Plan of the Cordage Store House under the Spanish Armoury'. The stairs leading to the Spanish Armoury are shown against the north wall of the

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1. Britton & Brayley (1830), p. 328.

storehouse and against a building labelled 'Browne's House'. The latter was probably the porter's lodge at the entrance into Coldharbour which was largely rebuilt in 1673 (see p. 36 above).

XXXIII. (Fig. 32). P.R.O. WORKS 31/71. Former WO ref. $Z^6/_{71}$.
Plans and sections of Middle Tower by Clement Lemprière dated March 1717. Scale of 10ft to an inch. Three plans taken at roof, first and ground floor levels, with east-west and north-south sections. This is a particularly important record of the architectural features that were lost during the alterations of 1717-9 (see p. 105 above). Clearly shown is a portcullis and screen on the first floor (*cf.* surviving examples in Byward Tower), medieval or Tudor timber framing over the rear of the gate passage and high medieval walls pierced with arrow loops on the south side of the causeways to the east and west of the building.

XXXIV. (not illustrated). P.R.O. WORKS 31/74.
Duplicate, but damaged copy of **XXXIII** above.

XXXV. (not illustrated). P.R.O. WORKS 31/72. Former WO ref. $Z^6/_{25}$. Former Ordnance ref. B.10.T.23.
Plans of the roof, first and ground floor levels of the Middle Tower taken before the alterations of 1717-9. No scale given. Appears to be the draft for the plans incorporated in **XXXIII** and **XXXIV** above.

XXXVI. (Fig. 33). P.R.O. WORKS 31/73. Former WO ref. $Z^6/_{26}$.
North, south, east and west elevations of the Middle Tower drawn by Clement Lemprière in 1717 in advance of the alterations carried out in 1717-9. No scale given. This complements **XXXIII** above and provides additional information about the form of the timber framing over the rear of the gate passage, the medieval arrow loops in the gate towers and the walls along the sides of the causeways.

XXXVII. (Fig. 34). P.R.O. WORKS 31/70. Former WO ref. $Z^6/_{26}$. Former Ordnance ref. B.10.T.25.

Four elevations of the Middle Tower showing proposed restorations, dated 1717. Scale of 10ft to an inch. A label at the top of the drawing which reads 'Elevations of Martins Tower Since its reparation' was probably added at a slightly later date.

XXXVIII. (Fig. 29). P.R.O. WORKS 31/124. Former WO ref. $Z^6/_{25}$. Former Ordnance ref. B.10.T.27.

Plans and sections of stone building annexed to the east side of White Tower by Clement Lemprière, dated 1717. Scale of 10ft to an inch. The north-south section shows the upper floor fitted out as the Ordnance Drawing Room and Record Office with the presses and shelves that was ordered to be installed in February 1716 (see p. 92 above). The Drawing Room is seen to occupy the northern two thirds of the upper floor, the Record Office must, therefore, have occupied the area to the south. The survey also shows the wall and palisade erected about the White Tower during the reign of Charles II (see pp. 34 & 40 above), this had probably been removed by the end of January 1717 when a contract was signed to construct the Carriage Storehouse against the south side of the White Tower (see p. 88 above), the drawing, therefore, was presumably prepared during the first few weeks of 1717.

The survey evidently represents the earliest surviving detailed view of the enigmatic medieval building attached to the White Tower and it is interesting to note that the roof over the Drawing Room is a storey lower than the parapet of the external wall. This might suggest that the structure had once accommodated a third floor.

XXXIX. (Fig. 57). B.L., Kings Topographical Collection, XXIV.23.n.

Plans and elevation of the main guard against the west face of the White Tower dated 1717. Scale of 5ft to an inch. This is either the draft of the building that was erected in 1717 (see p. 58 above) or a survey of the structure taken immediately after it was constructed. The plans marks (in dotted lines) the position of the guard beds in the larger rooms on the ground and first floors (*cf.* **XLI** below) and the officers' beds in the two smaller rooms to the north.

XL. (not illustrated). P.R.O. WORKS 31/176. Former WO ref. $Z^6/_{29}$. Former Ordnance ref. B.10.T.29.
Ground plan and elevation of the new main guard against the west face of the White Tower, 1717. Scale of 5ft to an inch. This is an incomplete version of **XXXIX** above.

XLI. (Fig. 58). B.L., Kings Topographical Collection, XXIV.23.o.
Plan and section of the guard bed on the ground floor of the new main guard building, dated 1717. Scale of 2ft to an inch. The position of the bed can be identified in **XXXIX** above. The large recess shown in the top left hand corner is evidently a fireplace.

XLII. (Fig. 28). P.R.O. WORKS 31/188. Former WO ref. $Z^6/_{31}$. Former Ordnance ref. B.10.T.33.
Plan and elevations of 'Offices for Clerks to be built in Cold Harbour' dated 1717. Scale of 10ft to an inch. This is the draft for the eastern extension of the Ordnance office constructed in 1717-8, opposite the New Armouries Building (see pp. 90-91 above).

XLIII. (Fig. 6). P.R.O. WORKS 31/123. Former WO ref. $Z^6/_{27}$.
Plans and section of New Armouries Building signed by Clement Lemprière and dated 1717. Scale of 10ft to an inch.

XLIV. (Fig. 30). P.R.O. WORKS 31/146. Former WO ref. $Z^6/_{29}$. Former Ordnance ref. B.10.T.30.
Outline plan of the Chapel of St Peter ad Vincula and buildings against curtain wall to the west, drawn in 1717. Scale of 10ft to an inch. The Ordnance Labourer's house built in 1686 (see p. 103 above) is shown to the north of the chapel's tower, his coal-house to the south and wash-house against the curtain wall to the west. The resident chaplain's lodgings are depicted immediately to the south of the Labourer's wash-house in the form of brew-house, coal-house, parlour and kitchen. Beyond is 'Mr Whites house' - a house built in 1686 for an Ordnance clerk (see p. 103 above). To the south is shown a coach-house and some buildings attributed to the gun furbishers.

XLV. (Fig. 26). B.L., Kings Topographical Collection, XXIV.23.p. P.R.O. WORKS 31/163. Former WO ref. $Z^6/_{29}$.
Plan, elevation and section of Carriage Storehouse in Coldharbour dated 1717. Scale of 10ft to an inch. This is probably the draft for the storehouse erected against the south face of the White Tower in 1717 (see p. 88 above).

XLVI. (not illustrated). P.R.O. WORKS 31/163. Former WO ref. $Z^6/_{29}$. Former Ordnance ref. B.10.T.22.
Duplicate of **XLIV** above.

XLVII. (Fig. 27). B.L., Kings Topographical Collection, XXIV.23.q.
Details of Carriage Storehouse pipe head and doors dated 1718. The pipe head (hopper head) is drawn to scale, doors, 1ft to an inch. The former bears the monogram of George I and is dated 1717, the year the storehouse was constructed. The panelled doors are of stable construction and were positioned at either end of the building as well as in the centre of the south front.

XLVIII. (not illustrated). P.R.O. WORKS 31/164. Former WO ref. $Z^6/_{32}$. Former Ordnance ref. B.10.T.35.
Detailed drawing of 'Door of the Carriage Shed in Coldharbour' dated 1718. Scale of 1ft to an inch. Duplicate of doors depicted in **XLVII** above.

XLIX. (Fig. 35). P.R.O. WORKS 31/190. Former WO ref. $Z^6/_{31}$. Former Ordnance ref. B.10.T.34.
Ground plan, elevation and section of Old Hospital Block, dated 1718. Scale of 10ft to an inch. Labelled 'Plan and elevation of 4 Houses to be built for the Surveyor of the Small Arms, and three of the Chief Clerks in the Tower'.

L. (Fig. 20). P.R.O. WORKS 31/108. Former WO ref. $Z^6/_{23}$.
Ground plan of the Grand Storehouse and surrounding area by Lewis Petit dated 1718. Scale 10ft to an inch. Part of a survey which includes **LI** and **LII** below.

LI. (Fig. 21). P.R.O. WORKS 31/107. Former WO ref. $Z^6/_{23}$. Former Ordnance ref. B.10.T.19.
First floor plan of the Grand Storehouse by Lewis Petit dated 1718 showing the layout of the Small Armoury. Scale of 10ft to an Inch. Part of a survey which includes L above and LII below.

LII. (Fig. 19). P.R.O. WORKS 31/120. Former WO ref. $Z^6/_{24}$. Former Ordnance ref. B.10.T.22.
'Elevation of the Partition at the West End of the Small Armoury' signed by Lewis Petit and dated 1718. Scale of 4ft to an inch. Part of a survey of the Grand Storehouse which includes L and LI above.

LIII. (Fig. 24). P.R.O. WORKS 31/116. Former WO ref. $Z^6/_{30}$. Former Ordnance ref. B.10.T.31.
Elevation of the north wall of the Artillery Room on the ground floor of the Grand Storehouse, showing proposed arrangement of ordnance and gunners' accoutrements, *c.*1718. Scale of 3ft to an inch. This is a sketch design for rearranging the artillery train in the wake of the structural repairs that were carried out in the room in 1718-9 (see pp. 83-4 above). The total number of guns indicated is one hundred and eight. These range from twelve heavy 24-pounders to twenty-four diminutive 1½-pounders. The largest pieces are shown in the centre of the room with 3-pounders to the west and 12, 6 and 1½-pounders arranged, in that order, to the east. The four doorways, shown from left to right, provided access into the Iron Vault, Grand Staircase, stairs to the roof floor and an unnamed storeroom to the east (*cf.* Fig. 20 below). The wall is divided into twenty-one bays by posts resting on corbels - their spacings evidently determined by the disposition of the ceiling trusses. Between the posts, and over a moulding located 5ft 6in above the floor,[1] is a series of proposed arches into which the gunners' accessories could be arranged. The arch detailed in the bottom right-hand corner has a cartouche below the

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1. This is possibly the 'Pedestal Moulding' mentioned in an account for distempering the walls dated 31 March 1719, WO 51/103, f. 116.

keystone marked '12.P.', evidently meaning 12-pounder - the size of the gun that the ladles and sponges shown would have serviced.

LIV. (not illustrated). P.R.O. WORKS 31/116. Former WO ref. $Z^6/_{30}$. Former Ordnance ref. B.10.T.31.
Elevation of one of the proposed arches to be formed in the north wall of the Artillery Room, *c.*1718. This is a more accurate representation of the arches shown on **LIII** above.

LV. (Fig. 25). P.R.O. WORKS 31/116. Former WO ref. $Z^6/_{30}$. Former Ordnance ref. B.10.T.31.
Elevation of proposed recesses to be formed in the north wall of the Artillery Room, *c.*1718. This is a variation on the design shown in **LIII** and **LIV** above. Here the recesses appear as niches and it is interesting to note that the left-hand example exhibits a trellis which might have an association with the 'Chequer work' put up by the carpenter in the room in 1718 (see p. 84 above).

LVI. (not illustrated). P.R.O. WORKS 31/81. Former WO ref. $Z^6/_{32}$. Former Ordnance ref. B.10.T.52.
Section through White Tower dated 4 March 1719. Scale of 10ft to an inch. The eastern chamber of uppermost floor is labelled Sword Room, the chamber immediately below, the Match Room.

LVII. (not illustrated). P.R.O. WORKS 31/82. Former Ordnance ref. B.10.T.51.
Plan of uppermost floor of White Tower complementing **LVI** above and therefore presumably also dated 1719. Scale 10ft to an inch. The plan shows three chambers labelled Match Room, Sword Room and 'Caesars' Chapel.

LVIII. (Fig. 36). P.R.O. WORKS 31/191. Former WO ref. $Z^6/_{33}$. Former Ordnance ref. B.10.T.38.

Ground plan and three-dimensional elevation of 'Mr Levins House adjoining to Lanthorn Tower' dated 13 June 1719. Scale of 10ft to an inch. This is the draft for the building that was erected on the site in 1719 (see pp. 106-7 above).

LIX. (not illustrated). P.R.O. WORKS 31/121. Former WO ref. $Z^6/_{33}$. Former Ordnance ref. B.10.T.36.

Plan of the ground floor of the New Armouries Building dated 1719. Scale of 10ft to an inch. Part of a detailed survey of the building which includes **LX** below.

LX. (not illustrated). P.R.O. WORKS 31/122. Former WO ref. $Z^6/_{33}$. Former Ordnance ref. B.10.T.37.

Plan of the second floor of the New Armouries Building dated 1719. Scale of 10ft to an inch. The drawing shows that the storage facilities were intended for sea stores.

LXI. (Fig. 59). P.R.O. T 1/343.

Plan of the first floor of the Martin Tower showing the Jewel Keeper's apartment with a plan and elevation for a new accommodation block, dated *c.*1719. Scale of 10ft to an inch. The proposed new building represents an unexecuted design by the Ordnance to replace the old staircase and outbuilding which they removed in 1719 (see p. 134 above) and whose position can be seen in dotted form against the curtain wall to the west of the Martin Tower, close to the end wall of the Grand Storehouse.

LXII. (Fig. 38). P.R.O. WORKS 31/204. Former WO ref. $Z^6/_{35}$. Former Ordnance ref. B.10.T.40.

Plan and section of water engine dated 1721. Scale of 2½ft to an inch. Labelled 'DRAUGHT of the WATER ENGINE IN THE TOWER with the design'd Alterations, and Additions which are colour'd Yellew'. The drawing carries a detailed explanation of the parts of the machine and is endorsed by Clement Lemprière and dated 23 June 1721.

LXIII. (not illustrated). P.R.O. WORKS 31/83. Former WO ref. $Z^6/_{34}$. Former Ordnance ref. B.10.T.39.
Plans and sections of the Scotch Storehouse in the White Tower drawn by Clement Lemprière and dated 1721. Scale of 5ft to an inch. The storeroom can be identified as occupying the east chamber on the first floor.

LXIV. (not illustrated). P.R.O. WORKS 31/117. Former WO ref. $Z^6/_{38}$.
Plan and profile of proposed vaults against the north side of the Surveyor-General house, dated 14 June 1722. Scale of 5ft to an inch. This is the draft for an extension to the Surveyor-General's house built in 1699-1701 (see p. 104 above).

LXV. (Fig. 17). P.R.O. WORKS 31/113. Former WO ref. $Z^6/_{37}$. Former Ordnance ref. B.10.T.43.
Elevational survey of the Grand Staircase in the Grand Storehouse by Clement Lemprière in 1722. Scale of ½ an inch to a foot. Carries the label 'The 4 Dimensions shew the four sides of the stair case from top to bottom and taken from Left to Right represents the same gradually going down'.

LXVI. (not illustrated). P.R.O. WORKS 31/60. Former WO ref. $Z^6/_{37}$. Former Ordnance ref. B.10.T.42.
Plan and profiles of 'Mr Neals Cellor at Constables Tower' drawn 25 June 1722. Scale of 5ft to an inch. This is evidently a survey of the ground floor chamber of the Constable Tower.

LXVII. (not illustrated). P.R.O. WORKS 31/162. Former WO ref. $Z^6/_{36}$. Former Ordnance ref. B.10.T.41.
Survey of the east side of the Tower and its Liberties, dated 1722. Scale of 100ft to an inch. The survey was evidently taken as a result of a land dispute with the Hospital of St Katherines by the Tower and an area of the plan is labelled 'The Red line from A to B is the Extent of the Ground demanded by the Master Brothers and Sisters of St Katherines'.

LXVIII. (not illustrated). References as **LXVI** above.

Copy of **LXVI** above, but drawn at a scale of 50ft to an inch.

APPENDIX A

These are to Certifie that I have taken a view of the Moat about the Tower of London, and the houses about the same, and of the Bulwarke, and I doe humbly conceive that if the Moat be cleared, and the Encroachments of the houses into the ditch and the two sheds by Irongate be taken a way that the rest of the houses may stand without any prejudues to the Tower, but yet if any of the rest of the houses shall be thought fit by his Majestie to be pulled downe hereafter, the Lieutenant of the Tower is contented that they shall be pulled downe, not withstanding any grant to be made to him from his Majestie and that a Clause to that purpose be inserted in his Grant Given under my hand the 26th of November 1663.

Albemarle

May it please your Majestie

This business lay long in my hand because of the importance of the place, almost your single Magazine, but now my Lord Generall (a much more competent Judge then myself) haveing particularly view'd it and given his opinion, and Sir John Robinson haveing subjected to have any houses be pulled downe in case it be so judged fitt. I humbly submitt all to your Majesties great wisdome.

December 5th 1663 Southampton

Source: photocopy of document on English Heritage file CB 70/A. The original was sold privately during the 1970s and its whereabouts now is unknown.

APPENDIX B

Charles R

Whereas upon the Report of the Lords appointed a Comittee to inspect & examine the present state & Condition of Our Tower of London touching the Alterations & Repairs judged necessary to be done forthwith for the safety & conveniency thereof, & of the Garrison therein, as likewise upon view of the Estmates of the charge of effecting the same amounting in all (besides what concern'd the preservacon & keeping of Our Records) to the sume of £6697.2s.7d, We were pleased to take the same into Our Princely consideracon, & to approve thereof, & by Our Order in Council at Our Court at Whitehall of the 8th of ffebr. 1681 to direct the Commissioners of Our Treasury to take care to provide money so soon as the state of Our affaires will permitt for carrying on the said reparacons & other services menconed in the said Report, Our Will & Pleasure therefore is, & We do hereby authorize, direct, & require you, that you cause the Particulars represented in the said Report & Estimate most requisit to be done, & provided for to be forthwith putt in execucon undertaken gone in hand with & finished. And for as much as it is amongst other things thought requisit, & so represented in the said Report & Estimate Article the 5th that two litle houses in the

the Tower to be repaired

Mint at both ends of the new Platform necessary to be made upon the line over against Divering Tower be taken down; We do hereby authorize & require you that you cause the said two litle houses to be taken or pulled down for the making & fitting the Reverse for the Guns there intended to be planted. We likewise authorize, direct, & comand in pursuance of the 22th article of the said Report & estimate that you cause to be pulled down 2 Warders houses scituat against the Lieutenants Stables, also the Brickwall round the Bowling green & garden as farr as the said Lieutenants house to bring it all upon a Levell for a Large Parrade Place, & to cause the Brick wall to be brought in one place to a Straight line towards the maine Guard from the bloody Tower to the Hill, & to take care the earth be carryed away, & the whole ground for the Parade place be plaved. And Our Will & Pleasure further is & We do hereby strictly charge & require you that you cause every other Particular article in the said Report & Estimate menconed & exprest, & all & every thing or things therein Proposed as requisite for Our serice to be done to be duly observed & with all convenient speed to be performed. And for so doing this shall be as Well to you as the Constable & Lieutenant of the Tower & all other our Officers whome it may Concern a sufficient Warrant & discharge Given at Our Court ay Whitehall the 13th day of July 1682 in the 34th year of Our Reigne.

To Our Trusty & welbeloved
Councellor George Legge Esq
Master General of our
Ordnance

By his Majestys Command
Conway

At the Court at Whitehall the 8th
of ffebruary 1681

The Kings most excellant Majesty in Councill

Upon reading this day at the Board the annexed Report from the Right Honorable the Lords appointed a Comittee to inspect & examine the present state & conditon of the Tower of London, setting forth the alteracons & repaires judged necessary to be forthwith done for the safety & coneniency thereof & of the Garrison there, together with the Estimate of the charge for effecting the same, & also representing to his Majesty what is fitt to be done for putting in Order & preserving the Records within the said Tower, which was likewise referred to their Lordships, his Majesty taking the said Report into consideration was pleased to approve thereof, & did Order that it be, & it is hereby referrred to the Right Honourable Lords Commissioners of the Treasury to take care to provide money so soon as the state of his Majesties affaires will permitt for carrying on the said Reparacons & other services menconed in the said report.

May it please uour Majesty

Your Majesty having been pleased by your Order in Council of the 2nd day of December last to appoint us to inspect & examine the present state & condition of the Tower of London, & particularly to consider of the meanes of preventing the danger of fire it is exposed to by reason of several stables made use of by the Officers & other persons within the Tower, as likewise what repaires & other works are most necessary to be forthwith done in & about the said Tower for the safety & conveniency thereof, & the garrison therein.

We have in pursuance of your Majestys Command taken a view of the Tower, & recorded an accountt from the Lieutenant, the Officers of the Ordnance, & several others in their respective stations. And that we might the better lay before your Majesty what is now necessary to be done, We perused a Report made to your Majesty in Council on the 1st of December 1679 by the Earle of Sunderland, Earle of Essex & the Lord Viscount Hide, wherein their Lordships represented several particulars to your Majesty's consieracon fitt to be done with as much expedicon, as the state of your Majesties affaires would allow of, great part of which upon Our View & the informatcon We received from the Officers We finde allready perfected, & some particulars in that Report

menconed as well as others which to Our observacon We humbly offer to your Majesty as most requisite to be provided for.

1st We humbly lay before your Majesty that no stables or Coach-houses whatsoever be suffered within the Walls of the Tower, but that they be converted to other uses more necessary for your Majesties service, as Barracks for souldiers & Gunners &c the charge whereof is computed in the following Estimate.

2ly We likewise humbly represent to your Majesty that whereas the number of the Gunners that belong to the Office of the Ordnance is 100 whose pay is 6d per diem. & who are many of them at present of other Trades & not skilled in the Art of Gunnery, that it is Our Opinions, if the said number of 100 Gunners were reduced to the number of 60 Effective men, whose pay might be 12d per diem each, & they required to lodge constantly in the Tower, & exercise as a Company under the discipline of the Master Gunner of England who may comand as Captain & exercise them once a week in winter & twice a week in sumer as Gunners that it would be much more usefull to your Majesty's service, & the charge very litle encreased more than what it is at present, vizt. 10s per diem amounting to £182 10s per anum.

60 men at 12d per diem in the yeare comes to £1095	
100 men at 6d per diem in the yeare comes to £912.10s	

3ly What is requisite for your Majesties service to be forthwith done in repairing the walls & sundry works in & about the said Tower for the necessary defence & security thereof, & the Garrison therein: We take leave humbly to Offer you Majesties consideracon together with the Estimate of the charge of every Particular brought in to us by the Officers of the Ordnance according to your Majesties Order in Council of the 27th January 168$^{1}/_{2}$.

1st That there be built & made a paire of strong doore gates with a Wicket at the comeing in of the Bullwork gate neare the Lyons with a Triangle Pallizado for the gate: also a Centinell box above the said Gate with a Ladder Estimated at £98.15d.9d.

2 Between Martin's Tower & the Byward Gate at the comeing into the Tower requires a Draw-bridge to be made with a paire of Gates & wicket, Also a stone wall on both sides of the Draw-bridge 12 foot long on each side from the bottom of the Tower ditch to the height of the passage & for taking down the Brickwall on one side of the Passage into the Tower from the Byward Gate to Martins Tower so low as the said Brickwall is on the other side, & Coped on the Topp with a Brick on an Edge in Mortar - £195.10s.

3 ffor making a Platform upon the first Line of the Rampart to be 18 foot broad for the Reverse of the Guns being 104 foot long upon
done strong Joysts & 3 inch planck, the roof of the new melting house to remaine: but 12ft in depth to be taken of the said upper house for the planting of 10 Guns mounted upon new fashioned shipp Carriages to have the Command of the Gate - £267.13s.

4 ffor taking of the uppermost of the Coping stone from the Topp of the Parapett round the Line of the mint from the Buyward Gate to the Brass Mount & from thence near the Devils
done Tower, to Cope the said Parapett with stock bricks on an Edge in Mortar, & to make up all the Portholes for Musqueteers, & a foot banck against this Parapett of 1 foot & ½ high, & 3 ft broad of Brick, to Cope the breadth of the foot-banck with stock bricks on an Edge in Mortar £295.12s.4d.

5 The Tower upon the Line over against Diverin Tower to be made for 2 Tyers of Guns containing in all 11 Guns to which end it will be requisite to build a stone wall on the inside of 2½ft thick, & the first story to be 10ft high, upon this to be layd a floor of Oaken
done Joysts & firr deale boards, & to lay lead upon the said floor above this floor to raise aother 2ft higher, & there to lay the timber of the upper Platform with a stone Brestwork of 4½ft

high coped on the topp with stock brick on an Edge in Mortar, Likewise to take down 2 litle houses on both ends of this new Platform, there being no place for the Reverse of the Guns there all which will amount per Estimate - £315.13s.4d.

6 Upon the Angle between this Towers Platform & the Brass Mount to sett up a large Centinall house of 6ft sq, projecting so much over the
done said stone wall, that the inside of the Centinell house shall be even ranged with the Outside of the stone wall for the better defence of the Graft, the Plancks to be 3 inch thick of Oake, & doubled cross to the inside with a firr deale board, & painted 3 times over in Oyle Colour - £25.

7 ffor repairing the Brass mount Tower, the parapett to be 7½ft high above the Platform, the Topp to be coped with stock bricks on an Edge in Mortar, the Outside towards the ditch or Graft to be ½ft lower than the Inside: between the Gunns to make a double foot bank,
done each 1½ft high & 3ft broad; the topp coped wth stock bricks on an Edge in Mortar, & to make 6 Ports for guns where they shall be Ordered, & 4 Ports in the Vaults below to cleare the Graft - £74.4s.8d.

Memorand. that whereas there is a litle house that goes down the stairs from the Platform into the Vault, that at present no

not to be done

body lives in, but the same is lett lately by Sir Thomas Wharton Warden of the Mint to Mr Porteen for £5 per anum. The said house is very convenient to Lodge 4 Gunners to be ready on the Line & Platform on all occasions. Upon this Platform of the Brass mount are at present Quartered 14 souldiers.

8 There is a litle square Tower upon the Line between the Brass mount & Divills Tower of 5½ foot broad & 12ft long, where may be placed below 2 small Guns for defence of the Graft and before the comeing into the said Tower the Rampart being fallen down the same is requisite to be made again to its full breadth as the next Rampart, with a paire of stares to come from the Mint upon the Rampart - £25.

9 To make a great Platform of 70ft long & 25ft for the reverse of the Guns being for 7 Guns, to be built where the Old souldiers Barracks are built against the same Rampart over against

done

the new Barracks, the said Old Barracks will not stand longer than 2 yeares the building being Old - £247.5s.8d.

Memorand. That in place of these Old Barracks it is very requisite & necessary, that a new row of Barracks be built for 2 Companies & ½ of souldiers in the Garden against the stone wall bewteen Salt Tower & Constables Tower. Estimate whereof follos vizt. No. 11.

10 A Platform to be made next to the Devils Tower 40ft long & 20ft deep, for the reverse of
done the Guns being for 4 Guns - £125.10.8.

11 The building of a new row of souldiers houses for 2 Coompanies & ½ against the Old stone Inner wall of the Tower in the Garden between the Salt Tower & Constables Tower as was surveyed heretofore by the Rt Honorable the Lords of his Majestys Council. the charge amounts to - £900.18s.8d.

12 The Devils Tower in the 2 stories to mend & strengthen the floares to place on every floare
doing 2 Guns, & at the topp of the Tower 2 Guns - £30.

13 To place 2 Guns upon a litle Battery between the Devil's Tower & Mr Conyer's stables mounted
done on a new Carriage which shall be Estimated hereafter.

14 The Tower next Mr Conyer's stables belonging to a Warden is 12ft wide & 10ft broad. in the vault below is a Gunn placed to clear the Ditch

in this Tower can be made lodgings for 2 Gunners onely - £8.15s.

15 The stables of Mr Conyers & Sr Jonas Moore being 18ft sq in the cleare to be raised one story higher, & lodgings for 12 Gunners to be made of the sayd Building - £59.6s.8d.

contracted for

16 It is requisite that 6 Guns more be brought upon the great Platform to the river side upon standing Carriages. The Carriages shall be Estimated hereafter £59.6s.8d.

17 ffor finishing the Outside of the Brickwall of Tower ditch in length 620ft of the same dimensions as the other Brickwall was made before beginning where the Brickwall was left off near litle Tower Hill to the Iron Gate - £1330.10s.

The Inner Stone Wall & Towers upon the sayd Wall

18 The 2 Towers marked AA upon the Mapp being the Buyward Gate at the comeing into the Tower. upon the 2 said Towers may be planted 7 guns the making the Platforms of Oaken timber with a Parapett will amount to £80.4s.

contracted for

Beauchamps Tower near the Lieutenants stables marked upon the Mapp letter M is a large Tower for 5 Guns to be placed thereupon the making

of the Platform of Timber with a Parapett will Cost - £77.6s.

Deverin Tower at the end of the Old Office of the Ordnance under which is a large Vault marked upon the Mapp letter L for 4 Guns to be placed upon. the making of the Platforme of oak Timber with a Parapett & fitting up the staires to come upon the Tower will amount to - £80.5s.

contracted for

fflint Tower marked letter K for 3 Guns to be placed upon. The making of Platforms with a Parapet & repairing the staires will amount to - £57.12s.

contracted for

Bowyers Tower behind the Old storehouse marked upon the Mapp Letter I for 3 Guns. The making of the Platform of timber & a Parapett with the making up the Old staires will cost - £54.

contracted for

The Brick Tower marked letter H for 3 Guns. the making of a Platform of Timber & a Parapett with repairing the stairs will cost - £59.17s.8d.

contracted for

The Jewell Tower marked upon the mapp with G for 3 Guns. Severall Lutherin lights are in this Tower sett up so that if a Platform be ordered to be built upon the Tower the said Lutherin Lights must be taken downe. The

Platform of Oaken timber & the Parapett will amount to - £54.

contacted for

Constables Tower marked ff for 3 Guns Platform of timber & Parapett will cost - £54.

Broad arrow Tower next the new storehouse marked upon the Mapp with lettres BC. The Platform of Timber & the Parapett for 4 Guns will amount to - £64.

contracted for

Salt Tower near the Lord Constables stables marked in the Mapp letter [D] for 4 Guns. The making of the Platform of Oaken & the Parapet will amount to - £80.10s.

done

The making of a Large Platform of Oaken timber upon the Leads of St Thomas Tower over Traytors Gate marked upon the draught letter [X] to the river side 81 foot long 30 foot broad Plancked with 3 inch Oaken Plancks being for 9 Guns. This Platform is necessary to be done having a fflanck on each side for two Guns to cleare the Ditch or Graft will cost - £294.

Total of the Platformes &c in this Paragraph No. 18 is - £955.14s.8d.

19

contracted for

To pull down all the walls that are built by the several Officers cross over the stone Rampart of the inside of the Tower, that hinder

the goeing the rounds upon occasion from Tower to Tower will cost - £45.

20 To make up the battlements of the Inner Line of the Parapett between the Towers where it shall be requisite will cost - £90.

21 Two sally-ports to be made in the Vaults of Diverin Tower & the Jewell Tower to come from the inside of the Tower into the passage of the Mint. two litle shedds must be pulled down at the foot of Diverin Tower in the Mint to make the passage will cost per Estimate - £69.10s.

one contracted for

22 The pulling down the 2 warders houses over against the Lieutenant of the Tower's stables & all the Brickwall round the Bowling Green so farr as the said Lieutenants house to bring it all upon a Levell for a large Parade place & to bring the Brickwall in one place in a straight line towards the main Guard from the Bloody Tower to the Hill with the clearing the Earth away & paving the whole ground for the Parade place - £426.8s.10d.

23 To repaire the stone Platform before the maine Guard when the new one is built - £9.15s.

24 ffor building of a new maine Guard upon the Hill where the Old one is at present of 47 ft 2 inch long & 19 ft 7 inch broad a brick wall

round & the Old Roof to be sett upon the new Guardhouse with the taking down the Old wall will cost - £120.4s.8d.

25 To make 2 Warders houses of the Lieutenant of the Towers stables the said stables being 48ft long and 17½ft broad & 2 storees high, the Garrets being left for the servants of the Lieutenant of the Tower, the fitting the said stables compleat for lodgings will cost - £98.14s.8d.

26 The Lieutenant of the Tower's Coach-house being 20ft in the front & 10 ft deep may be rebuilt & made a story higher of those materials that come of the Old Warders houses before the Lieutenants stables wherein may be lodged 12 Souldiers - £52.10s.6d.

27 Memorand. Sir Thomas Stringer's lodgings over St Thomas Tower at Traytors Gate marked in the Mapp with letter X. there is one room of 9ft broad & 13ft long two stories high lett for £3.10s. per anum. Two litle rooms of 12ft long & 10ft broad each, but no story over head: One room of 20ft long & 12ft broad, no story Over head: Two rooms 6ft broad & 13ft long each, with a litle room of 6ft broad & 9ft long besides the Entry all this house belongs to Sir Thomas Stringer & lett at £10 per anum.

28 In Captain Sherburn's stable & Coach house

next to the chapell being 21½ft front & 17 foot deep may be built up Lodging for 6 Gunners with those old Materials of the 2 Warders houses over the Lieutenants stables that are to be pulled down - £40.15s.

29 The 3 stables & Coach houses belonging to the Lord Allington next to the Salt Tower over against the great Platform to the River side 60ft long 15½ft broad may be built & fitted up for souldiers Lodgings for 48 men, besides at the end a great Room with a Chimney & paire of staires to goe to the second story - £195.13s.7d.

30 The Coach-house of Sir Jonas Moore in length contracted for 18ft front 22ft deep requires to be built one story higher with a Roof in this Building may conveniently lodge 24 souldiers - £60.

31 A litle Brewhouse lately belonging to Sir George Wharton deceased is convenient to lodge 2 Comissioned Officers belonging to the Company that shall Quater in No 29 & 30 & to be fitted up will cost - £15.

32 Upon the Platform there requires for the number of 21 Guns upon standing carriages compleatly furnished and painted - £210.0s.0d.

And upon the Towers 69 Guns new fashioned ship Carriages to be made for mounting the said Guns compleatly finished - £228.0s.0d.

Incident charges - £180.0s.0d

Totall - £6697.2s.7d

Source: WO 55/396, pp. 76-83.

APPENDIX C

5 ffebruary 1682

Contracted and agreed the day and yeare above written by virtue of an Order of the Right Honourable the Lord Darmouth Master General of his Majesty's Ordnance and the Board of the 3rd Instant by and betweene the principall Officers of his Majesty's Ordnance for and on his Majesty's behalfe with John Downes & Robert ffitch Bricklayers on behalfe of themselves their Executors & Administrators for the Rayseinge and Buildinge up the Stone Wall of Diveryn Tower from the settinge of the Battlements fower ffotte thick the outside of which shall be Built with Kentish Stock Bricks the Inside and the Core of the Body with hard well Burnt Clamp Bricks conteyneinge the Number of sixe Rodds of Brickworke in all or thereaboutes.

And they the said John Downes and Robert ffitch hereby ffurther Contract for themselves their Executors & Administrators that as soone as the Carpenter has layed his joysts upon the Topp of this Wall that they shall and will att their owne proper cost and charges Wall the same up to the full height of the Topp of the said plattforme, & when it is planked, and the worke brought Round upon a Level they shall Build and make a parrapett 4 foote ½ high to the inside and fower foote to the outside Coped with stock Bricks in good Morter upon an edge and to make five Ambrazures where the same shall be ordered by his Majesty's chiefe Engineer conteyneinge aboute five Rodd of worke or thereaboutes ffor all which worke they shall be paid after the Rate of £6 per Rodd for the Brick worke, and 2s 6d per yard for the Copeinge of the said worke with hard Bricks upon an Edge as afforesaid and shall be paid one third parte of the value of the Contract by way of Imprest and advance upon Accompt of the said Worke and the Remainder of the Moneys in ffull of this Contract when the whole worke is ffinished and Compleated accordinge to Contract in good and workemanlike manner and the same surveyed and measured up which shall be within tenn dayes after the same is ffinished by way of Debenture for clearinge the Afforesaid Imprest Accordinge to the Course of the Office all which Worke they hereby Contract to compleate and ffinish in the space of fourteen dayes

tyme from the date hereof amounting in the whole to aboute seaventy one pounds the $^{1}/_{3}$ parte of which is £23.13s.4d

Bernard de Gomme

8 ffebruary 1682

Contracted and agreed the day and yeare above written by virtue of an order of the Board bearinge date the same day by and betweene the principall Officers of his Majesty's Ordnance for and on his Majesty's behalfe with Thomas Moore Carpenter for the pylinge the ffoundation with Good ffirr Timber for the Brick Wall to be Built upon answerable to that parte of the Wall already Built to the outside of Tower Ditch all which pyles shall be 18 and 20 ffeete longe or longer if occasion according as the Ground shall require untill such tyme as the said pyles are soe Driven that every Pyle shall fasten into firme Ground to make a firme and strong ffoundation for the Buildinge a Brick Wall upon as afforesaid all which pyles shall be of the scantleinges of 8 and 6 Inches and 8 by 11 Inches of Double Elm Bulks each Runninge Rodd of which ffoundation shall conteyne 21 such pyles as afforesaid or thereaboutes, and all the said pyles shall be Covered with two Inch Dramme ffirr planck and spiked downe upon the heads of the pyles, the ffoundation shall be eight ffoote Broad, or as Broad as the ffoundation of the old Wall is, and the said Thomas Moore shall Digg his ffoundation of the Earth Worke by parcell as the Brick worke goes on, there shall be also two Land Tyes upon every Rodd of Worke of 8 and 11 Inches scantleinge which shall be lay'd 15 ffoote in the Ground and all the ffoundation shall be layed upon a Levell, and the Earth that comes out of the ffoundation shall all the charge of the said Thomas Moore be brought without the Ditch neare the streete and shall not leave any of the Earth in the Grafte the Back syde of this Timber ffoundation shall also be filled up with Dry Earth well fast and Close Rammed as high as the Topp of the planck and the whole Worke shall be as well done in every respect as the Wall already Built on the Tower Ditch in good and Workeman like manner, and shall likewise att his

owne Coste and charge be obliged to keep and uphold the same good and substantiall for the space of one whole year from the date conteyneinge in all about the quantity of 38 Runninge Rodds ffor which he shall recieve after the Rate of Tenn pounds for every Runninge Rodd and shall ffinish the whole worke afforesaid in the space of three Months tyme from the Date hereof and be paid one third parte of the value in hand by way of Imprest upon accompt one third more when $^{2}/_{3}$ of the worke is done and the Remainder by Debenture for cleareinge the said Imprests when the worke is ffinished surveyed and Measured accordinge to the Course of the Office.

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Source: photocopy of documents on English Heritage file CB 70/A. The originals were sold privately during the 1970s and their whereabouts now are unknown.

APPENDIX D

A State of the Remains of Brass and Iron Cannon and Muskets at the Major Ordnance Stores

Brass and Iron Ordnance*

	CHATHAM		PORTSMOUTH		TOWER		WOOLWICH	
	Brass	Iron	Brass	Iron	Brass	Iron		
19 Oct. 1660	468	865	168	718	240	2,609		
31 Dec. 1662	463	1,040	193	645	536	2,804		
31 Dec. 1663	442	895	317	811	367	2,797		
18 Mar. 1669	429	1,320	116	1,275	205	1,504	131	1,946
21 Jan. 1671	425	1,239	146	1,107	193	1,610	112	2,181
11 Dec. 1672	394	1,327	57	470	288	904	66	1,224
1 Jan. 1676	470	1,659	42	1,538	301	721	22	1,792
31 Nov. 1679	350	1,323	106	1,154	301	551	90	2,090
5 Nov. 1688					202	412		
*c.*1691	343	1,189	123	1,470	226	152	166	3,558

* I.e. the number of all types of brass and iron cannon (including mounted, unmounted, train, naval or garrison guns), except mortars.

Source: Tomlinson (1979), p. 125; B. L., Harley MS. 7460.

Muskets*

	HULL		PLYMOUTH		PORTSMOUTH		TOWER		WINDSOR	
	Matchlock	Snaphance	Matcklock	Snaphance	Matchlock	Snaphance	Matchlock	Snaphance	Matchlock	Snaphance
17 June 1667	1492	100	50		2216	381	12,687	2,415	756	35
31 Dec. 1671							8,678	7,337		
7 Mar. 1678	1,277		1,006		6,170		17,835		2,544	
31 Nov. 1679							5,842	1,844		
21 Nov. 1687							6,111	6,945		
5 Nov. 1688							2,109	5,104		
25 Feb. 1689							1,947	1,540		
27 Nov. 1705							1,676	9,726		

* N.B. The totals include both serviceable and unserviceable muskets.

Source: Tomlinson (1979), p. 128; B.L., Harley MS. 7460.

NOTE ON MANUSCRIPT SOURCES

The major manuscript source for this study is found in the Public Record Office, where there are several hundred volumes relating to the activities of the late Stuart and early Hanoverian Office of Ordnance. The most important of these are arranged in the following series:

WO 46 contains out-letters between the Board and the Master-General, but is not of great importance in respect of the Tower at this time.

WO 47/3-33 is the minute books series covering the period 1662-1720 (with gaps). These are of crucial importance as they reflect the wide range of decisions taken by the Board. The early volumes contain a large number of entries relating to warrants, letters, reports and other papers received by the principal officers and noted as relevant to matters being discussed or actions taken. As the period progressed, however, this extraneous matter is increasingly excluded and the minutes become more formalised, indexed and more akin to how they would be compiled today.

WO 48 is the Treasurer's Ledgers and run continuously from 1660. The earlier volumes, though arranged somewhat haphazardly, are particularly useful as they contain entries otherwise missing in the contemporary Bill Book series (WO 51). Indeed, for the first ten years or so, the entries appear to be exact copies of those found in the Bill Books, thereafter they become increasingly summarised.

WO 49 contains an unbroken record of payments by means of debenture until 1690, as well as some miscellaneous estimates, while **WO 50** includes a record of quarterly payments to Ordnance staff beginning in 1694.

WO 51, the Bill Books series, represents the single most important surviving class of documents containing, as it does, a most detailed record of Ordnance expenditure. Apart from some omissions in the 1660s this series is complete.

WO 55 is a large, miscellaneous, class of Ordnance records. This important collection contains warrants from the Privy Council, copies of reports, inventories and miscellaneous papers of all sorts.

WO 94 contains the papers of the Constable's office at the Tower and includes material concerning the garrison and the defences.

Other public archives also contain important Ordnance material relating to the Tower, among them the Privy Council registers (PC), State (SP) and Treasury (T) papers and, most importantly, the records of the Office of Works (WORKS) which now contain most of the early Ordnance drawings of the Tower. Within the Public Record Office the only private collection that contains relevant material, dating from the 1660s, is the Pritchett MS. (PRO 30/37). Individual items of interest can be found in a number of other private collections the most important being found in the British Library (Harleian MS., Stowe MS. and King's Topographical Collection).

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GLOSSARY

Architrave. The lowest of the main divisions of an entablature. Also the mouldings around a door or window.

Ashlar. Squared blocks of stone laid in regular courses with fine joints.

Baluster. A small pillar or column, supporting a rail or coping.

Bandolier. A broad shoulder belt having small pockets or loops for cartridges.

Bay. An external or internal division of a building, marked, not by walls, but by units of vaulting, roof compartments, on order, window, etc.

Bowyer. A person who makes bows.

Brace. Inclined or diagonally placed members, usually employed to stiffen a structure.

Carbine. A light short-barrelled musket.

Cartouche. In architecture meaning a shaped tablet enclosed in an ornamental frame or scroll and often bearing an inscription or heraldic device. In military terms this refers to a case for holding musket balls or ammunition.

Casemate. Bomb-proof vault within a rampart providing an emplacement for a gun and/or accommodation for the garrison.

Casement. A window hinged on one of its edges, so as to open inwards or outwards.

Caulking. Process of stopping up or filling cracks and joints.

Console. A scrolled bracket.

Corbel. A supporting projection on the face of a wall.

Cornice. The uppermost member of an entablature, also any moulded projection which crowns or finishes the part to which it is fixed.

Cuirass. A piece of armour covering the chest and back.

Culverin. A cannon long in proportion to its bore.

Cupola. A term used to denote a small domed roof, or a small domed turret built upon a roof.

Embrasure. An opening splayed from within, usually in a fortified building.

Enceinte. The main defensive enclosure of a fortress excluding outworks.

Entablature. In the classical orders the assembly of horizontal members, architrave, frieze and cornice, supported by a column. These members may also be used on a wall without column support.

Falcon. The fifth in size of the guns of the culverin type, about a 2½-3 ponder.

Falconet. The sixth in size of the guns of the culverin type, about a 1½ pounder.

Fausse-braye. Outer rampart separated from and lower than the main rampart.

Festoon. A carved, modelled or painted garland of flowers, fruit or leaves, suspended in a curve between two points.

Frieze. That part of the entablature between the architrave and the cornice, or any similar decorative band or feature.

Frontispiece. The principal facade or bay of a building.

Gadroon. A decorative pattern formed of a series of convex ridges.

Gallotting. The insertion of tiny pieces of stone or flint into mortar courses while still soft.

Halberd. A weapon consisting of a shaft with an axe blade and a pick, topped by a spearhead.

Hand-spike. Wooden lever used to manoeuvre a gun and/or carriage into position.

Impost. The member, usually moulded, on which the ends of an arch rest.

Keystone. The central wedge-shaped block of an arch. Often used as ornaments on the heads of windows and doors.

Ladle. A long shaft with a half round cylinder at one end to hold powder and used to charge a gun.

Light. Part of a glazed window, or opening for light.

Linstock. A gunner's match holder used to fire a gun.

Loop. Narrow vertical slit in a defensive wall, from which defenders bows and guns.

Lunette. A semicircular window or panel.

Match. A length of cord or wick impregnated with a chemical, so that it burns slowly, and used to fire a gun.

Metope. The plain or decorated space between the triglyphs in a Doric order.

Minion. One of the smaller of the culverin type guns, about a 4 pounder.

Mullion. Vertical strut dividing a window into lights.

Order. The essential components of a complete order are a column with base, shaft and capital and an entablature with architrave, frieze and cornice. A pedestal may be added but it is not an essential part. The five orders are: Doric, Ionic, Corinthian, Tuscan and Composite.

Orillon. Projection of the face of a bastion beyond the line of a retired flank, serving to protect the flanks.

Partizan. A spear or pike with two opposing axe blades or spikes.

Pedestal. A support for a column, statue, etc.

Pentice. Lean-to building, covered passage or gallery.

Pike. A spearhead attached to a long shaft.

Pilaster. A rectangular column projecting slightly from a wall.

Pot. Part of an armour that covers the head.

Prop. A support, usually angled, used to strengthen the posts of a fence.

Quoin. In architecture the external angle of a building and the rusticated or otherwise emphasised stones applied to the angle.

Ranscur. A three-pronged staff-weapon, sometimes called a rawcon.

Ravelin. Triangular, detached work with or without flanks in a ditch in front of a curtain and between two bastions.

Redoubt. Small enclosed work without bastions, used as an outwork or placed inside a bastion or ravelin.

Rustication. A mode of building masonry, in which the individual blocks or courses of stone are emphasised by deeply recessed joints, and often by a roughened surface.

Saker. A gun of the culverin type, between the demi-culverin and the minion size.

Sally port. A small entrance and tunnel leading out of the fortications.

Saltpetre. Another name for potassium nitrate, used in the production of gunpodwer.

Sling. A gun long in relationship to its calibre, sometimes meaning a swivel breechloader.

Spandrel. The triangular area contained by one side of an arch, by a horizontal line taken from its apex, and by a vertical drawn from its springing; or the surface between two adjacent arches and the horizontal moulding or string cornice above them or the triangular surface between the outer string of a stair and the floor; also, the surface of a vault between two adjacent ribs.

Sponge. An implement for cleaning the bore of a gun after firing.

Stop-chamfer. A slay or carving used to terminate a chamfer.

String course. A moulding or projecting band running horizontally across a facade.

Tail board. A board, often decorated with paintings or carvings, applied to the gunwales of a boat.

Target. A small rounded shield on decorative carving.

Transom. Horizontal strut dividing a window into lights.

Triglyph. One of the rectangular blocks between the metopes in a Doric frieze, having two vertical grooves or glyphs in the centre and half-grooves on the edges.

Trompe l'oeil. A painting or decoration giving an impression of reality.

Waist board. A board, often decorated with paintings or carvings, located at the base of the cabin of a barge or small vessel.

Wedge. A piece of wood placed under the breech of a gun to alter its elevation. Sometimes called a quoin.

Wicket gate. A small door, often near to or part of a larger one.